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CONTENTS.

EDITORIALS:
Liability Insurance..... 57
The Need for Charging Stations..... 58
Resistance at Low Temperatures..... 58
Indeterminate Permit Constitutional..... 58
Smoke, Electricity and Health..... 59
DEPARTMENTS:
Commercial Practice..... 69
Electric Sign Data..... 73
Electrical Construction..... 74
Dollar Wiring Kinks..... 81
Public Service Commissions..... 82
Legal Notes..... 85
Questions and Answers..... 86
New Electrical and Mechanical Appliances..... 91
Latest Approved Fittings..... 96
Current Electrical News..... 97
Record of Electrical Patents.....103
LEADING ARTICLES:
Electricity in Woolen Mills..... 63
Deep-Well Pumping by Electricity.—By H. G. Hall..... 69
Electrical Installation in a Tannery..... 74
Electrical Installation in Plant of the Lincoln Ice Company 76
LETTER TO THE EDITOR:
Belt Slip and Power Loss.—By N. G. Near..... 89
MISCELLANEOUS:
Lansing Electrical Show..... 60
Workmen's Liability Insurance Rates Reduced in Ohio.... 60
British Electrical Exposition..... 60
Electrics in England..... 60
H. H. Scott..... 61
International Engineering Congress, 1915..... 62
Annual Convention of the Association of Iron and Steel Electrical Engineers 62
Electric Irrigation Pumping in Utah..... 71
Utah Company Inaugurates Appliance-Sales Campaign... 72
Power Campaign at Youngstown..... 72
Free Fan Service for the Sick..... 72
Electric Signs in Brussels..... 73
Cautions for the Electrician..... 75
The New Home of the Freeman-Sweet Company..... 79
Among the Contractors..... 80
Special Electrical Illumination for New York's Fourth of July Celebration 87
Annual Meeting of Electric Power Club..... 88
Main Exhibit Palaces of Panama-Pacific International Exposition Completed 90

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LIABILITY INSURANCE.

The enactment of workmen's compensation laws in many of the states in recent years has added to the liability for injuries occurring during construction work by electrical contractors as well as other classes of industrial concerns. As a result of this, rates for liability insurance have in many cases been raised and a very appreciable burden put upon the employers of electrical wiremen. In many cases these rates are based upon mere guesswork and the casualty and liability insurance companies have protected themselves by making sure that the rates are high enough to be upon the safe side. After statistics have been compiled under the new conditions there is no doubt that it will be found that in most cases such rates can be lowered, but in the meantime the electrical contractor will be put under an unnecessary burden unless he takes some action to obviate it. In Ohio the companies are already reducing rates.

In Illinois the state association of electrical contractors has achieved substantial results by taking united action to secure liability insurance at a more favorable rate. By throwing the entire business of the state contractors to one company it has been possible to secure a rate which is far less than that regularly quoted. This saving is partly due to the fact that the expenses of the insurance companies in securing new business is considerably lessened, since the element of direct canvassing can be eliminated when the business is handled by the state or other similar organization.

Mr. E. J. Burns, who has been canvassing the membership in Illinois for this purpose, estimates that the average saving for each electrical contractor in that state amounts to over $70 per year. Of course, the amount is much larger for concerns doing a large business, since the premium is based upon the payroll, and on the other hand it is much smaller for many of the smaller contractors. The saving effected in this line alone more than compensates any electrical contractor in that state for the expenses incident to membership in the state organization. The same thing can no doubt be accomplished by cooperative action in other states, and every state organization should make this function one of its prominent activities, for it is one which will well justify its existence. It is estimated that the payroll of all the electrical contractors in the country is considerably over $50,000,000 and a proportional saving in this item throughout would amount to a very

large aggregate if all the contractors were similarly affected.

It is possible, of course, for the national organization to take up this question as well as others affecting the interest of the electrical contractors, but there may be some question as to whether the matter can be handled as well nationally as by states. Variations in the liability laws in different states make the risks accepted by the insurance companies anything but uniform and consequently a uniform rate of premium cannot be expected. Undoubtedly, however, the national body can do much toward securing an equitable rate and national co-operation in placing this business can undoubtedly achieve something. This matter may well receive attention at the Detroit convention next week, and undoubtedly should be brought up for discussion at that time.

THE NEED FOR CHARGING STATIONS.

The possibility of utilizing the electric vehicle for touring and general out-of-town service no longer rests with the vehicle manufacturer. More than one manufacturer of electric vehicles has put upon the market a roadster type and there is no question as to batteries which will furnish the service desired in connection with this species of utilization. The article by Mr. J. S. Codman, which appeared in our last issue, emphasized the possibilities in this direction, which have received mention many times before. The electric vehicle as a touring car is a present reality, but to be utilized to any large degree it requires the existence and accessibility of charging stations at reasonable intervals along the route traversed.

The provision of such charging stations or at least of available connections at some point in every town of considerable size appears to rest with the central stations in the respective communities, at least where there are no garage facilities of this kind. If the local central stations will give consideration to this matter it will lead to the eventual building up of a service and a utilization of the electric vehicle which will be to their financial advantage and will furnish an added element of load which will reach important proportions.

As Mr. Codman has pointed out, it is quite feasible in many power stations to utilize an exciter for this purpose and the necessary arrangements would involve a cost which is almost insignificant. Such service at off-peak hours should be available in every central-station plant, and when such is the case we shall see electric roadsters penetrate to all parts of the country in numbers. A period of evolution to this state of affairs is, of course, necessary, but every central-station man should make it a point to assist in this development and promote its early realization.

It would be well if the various state electrical associations and the geographical sections of the National Electric Light Association were to take this matter up systematically and aim to provide general service.

RESISTANCE AT LOW TEMPERATURES.

Attention was called in the issue of September 6, 1913, as well as in previous issues, to the work which has been carried on by Prof. H. Kamerlingh Onnes at the University of Leiden on the resistance of pure metals at very low temperatures. Through the liquefaction of helium and its evaporation under reduced pressure, temperatures very close to the absolute zero have been attained. It is found that the resistance of such metals as have been tested in a chemically pure state, as platinum, mercury, gold and lead, becomes too small to be appreciable with the most sensitive apparatus which has been available for its measurement. Thus within a few degrees of the absolute zero the resistance of solid mercury is found to be less than one-ten-millionth of the value which it would have at zero centigrade if the solid state were continued up to that temperature.

A recent experiment conducted by Professor Onnes serves to illustrate this property more forcibly. A coil of lead wire consisting of 1,000 turns was short-circuited and reduced to a very low temperature by surrounding it by liquid helium. An electromotive force was induced in this coil by means of a magnetic field produced from outside the vessel and the resulting current was found to continue for hours.

The inductance of a coil of wire causes an electromotive force to be induced in it whenever the value of the current flowing is changed. The higher this inductance the more slowly any change of current in it will take place, other things being equal. If the electromotive force which has produced a current be discontinued, the current dies out at a rate which depends upon the resistance and the inductance of the circuit. The ratio of inductance to resistance is called the time-constant of the circuit, and this is a measure of the rate at which current will die out. If the resistance of a circuit were actually zero, the time-constant would have an infinite value, and the current would never die out. Looking at it from the standpoint of energy, there is no dissipation of energy when a current traverses a conductor having no resistance and consequently the magnetic field which is the evidence of a flowing current would persist. Under ordinary circumstances a current would take only tenths of a second, or at most several seconds to die out. The fact that in this experiment it took several hours shows what a minute value the resistance of the circuit must have.

INDETERMINATE PERMIT CONSTITUTIONAL.

A number of states have in their public utility commission laws incorporated the feature of the indeterminate permit. The constitutionality of this feature was contested in the case of the Racine Water Company in an action taken before the United States Supreme Court for the Eastern District of Wisconsin. The city of Racine decided to purchase the property of the water company and proceeded to have the utility valued by the Railroad Commission

for this purpose. The Farmers Loan & Trust Company, of New York City, acting for the bondholders, endeavored to secure an injunction against this proceeding and challenged the constitutionaliy of the indeterminate-permit feature. The decision of the court upholds the law.

SMOKE, ELECTRICITY AND HEALTH.

The agitation against the smoke nuisance has received occasional local and spasmodic support in various parts of the country, and arguments of various kinds have been raised against its continuance. Chicago and Pittsburgh have seen especially active campaigns, and in other cities, such as Cleveland and Minneapolis, computations have been made of the amount of soot deposited and of the economic loss resulting. A committee of the Cleveland Chamber of Commerce estimated the damage in that city at $12 per capita per annum, while a similar estimate by the smoke inspector of Chicago amounted to $8. This considered only the deterioration of property and the work of cleaning which is necessitated. Loss of fuel, damage to health, etc., must be added to the account.

A great many of our cities have provided smoke inspectors and smoke ordinances in an endeavor to reduce the evil, but the agitation has seldom been of such an energetic nature as to reach the status of a popular movement.

For many years past there has been an organization at work in England whose aim has been to bring to book those who are to blame for the vitiation of the atmosphere of big cities and industrial centers in this way. Some of the most ardent supporters of the movement have been chiefly influenced by their regard for beautiful architecture and the protection of public buildings; others have been anxious to improve the health of communities by preventing the people from breathing dust particles by the million and by lessening fogs.

The movement has passed through a number of stages during the last ten or twenty years. There have been those who have declared it to be an anti-industrial attack on factory owners by men who had purely esthetic ends in view; others have said that if the stoking were efficiently done and the right kind of fuel were used there need be no nuisance; others have urged the taking of strong measures against the private householder whose wasteful methods made him as a class a sinner worse than all the factories put together. At one period there seemed to be no better target for the aim of the smoke abaters than electric generating stations and the attacks were frequently described by engineers as sheer persecution blindly pursued by those who ought to have known that an electric generating station was itself providing the means to enable small factories to shut down their smoky chimneys by changing over to the electric drive, and to give the private householder a cheap way of abandoning wasteful coal fires. In not a few cases the municipality through one of its departments has prosecuted itself by summoning before the courts its own Electricity Committee!

The question is coming prominently before the people in England just now by reason of the sitting of a committee appointed by Parliament, and electrical interests may be safely trusted to get it right home to the committee and through it to both the Government and the public, that the electrical solution of the problem is the right one. To reduce the great fogs which now disturb trade, traffic and industry, and cause many accidents, would mean alone a saving of many millions of dollars annually. Electricity may contribute much assistance to that end. And its effect upon the public health can only be good. It gives cleaner houses, cleaner streets, and may lessen pulmonary complaints.

Very useful material for the education of those in authority as well as for enlightening the people on this pressing question, may be given by the engineers and managers who are responsible for the electric supply in centers of industry. They know that when a certain factory puts in electric motors there will be at least one less smoking chimney, and in the vicinity of big industrial works where changes are effected on a large scale, interesting calculations might be made.

The manager of one of the supply systems in Lancashire, the great textile manufacturing center of England, has issued a statement of this kind. He shows how the use of electric motors in the works of Bury has so far placed out of commission 24 chimneys which were previously required for the production of steam power. Furthermore, 27 other chimneys would have had to be provided if electric power had not been available. "The one large chimney at the power station is therefore being used instead of 51 smaller chimneys in the other parts of the town." But this change also carries with it, among its other advantages, a lessening of the traffic on the street, for the fuel consumed at the power house is delivered directly into the bunkers from the railway siding, whereas the 51 chimneys would have necessitated the carting of 200 tons of fuel per week for considerable distances through the streets. Mr. S. J. Watson, the engineer who issued this statement, has on his mains only 706 motors aggregating 5,025 horsepower. What a story many of our larger central stations might tell and how effective should be the aggregate contribution of electricity to the reduction of smoke nuisance were it to be calculated out!

We note that one of the London electricity companies is getting home to the public mind along the smoky ceiling line. By means of a diagram it shows the gradual deepening in shade that occurs as the year progresses—starting white after the "spring cleaning" and gradually getting worse until it reaches the Cimmerian blackness that precedes the "coming dawn" or the "spring cleaning" of the following year. It tells the way to avoid all that—use electric light and electric heat.

Lansing Electrical Show.

An elaborate electrical show is being projected by the Michigan Power Company, of Lansing, Mich., as a means of educating the citizens of Lansing to use more current for power, lighting, cooking, and other household uses. Manufacturers of electrical appliances in all parts of the country will be invited to participate in the exposition, which will be held Tuesday to Friday, inclusive, August 17-20. The show will be staged in a two-story brick building adjoining the plant of the power company in the business district of Lansing. This is a building containing 8,000 feet of floor space, all of which will be devoted to the show.

Rates in Lansing are very low, and an unusually large proportion of the houses, stores, and factories in Michigan's capital are now wired. The Lansing electrical dealers and the Lansing Jovian Boosters' League have already done much towards promoting the interests of electricity in the city, which has a population of 40,000, and the electrical show is expected to do even more.

Manufacturers, who may be interested in putting on a display at the show, will receive information by writing to D. R. Thomas, general manager, Michigan Power Company, Lansing, Mich.

Workmen's Liability Insurance Rates Reduced in Ohio.

Although manufacturers and others in the various branches of the electrical trades had been expecting an increase in their liability insurance rates under the workmen's compensation act of Ohio, they were pleasantly disappointed when in the recently announced adjustment of the rates they were in some cases favored by a reduction, and in others not changed. The greater number of industries in the state received a reduction averaging six per cent, which is made retroactive for the current year, involving a refund of about $100,000. The rates in Ohio are now extremely low, as this is the third reduction which has been made in less than two years, one of 22 per cent having been made in November, 1912, and another of ten per cent a year ago, which was also retroactive. As there is now in the compensation fund a surplus of nearly $2,000,000, it is quite probable that at the next readjustment of the rates a still further reduction will be made.

Examination for Electrical and Gas Inspector.

Technical examinations of applicants to fill the post of city electrical and gas inspector, an office created by a recently enacted ordinance in Louisville, Ky., have been announced for July 15. Advertisements to that effect announce that by July 12 all applicants for the appointment must file complete statements of their professional experiences. The examination will be conducted by City Engineer David Lyman, who will be assisted by a representative of the Bureau of Standards, Washington, D. C. Besides the technical examination, the applicants will be examined as to their grasp of the relations between utilities and the public.

British Electrical Exposition.

In conjunction with the British Electrical and Allied Manufacturers' Association, the city of Bradford is arranging to hold an electrical exposition in Bradford, England, October 6 to 24, 1914. As there is a population of 1,500,000 in a ten-mile radius, the exhibition should prove popular and of advantage to exhibitors.

While the display is intended to represent all branches of electrical engineering, a special feature will be the various mechanisms which can be driven by electric motors, such as textile and laundry machines, machine tools, etc., in order to show the advantages of electric drive.

American firms desiring to take space should make early application to the managers, Freer & Howard, Limited, Ludgate Chambers, 30-32 Ludgate Hill, London, E. C. Space will cost $1 to $1.50 per square foot. Current will cost only one and one-half cents per kilowatt-hour. There is every indication of a great increase in the use of electrical appliances in Bradford and vicinity.

An Electric-Vehicle Day Proposed.

Electric-Vehicle Day to be observed all over the country, is suggested by Robert Montgomery, commercial manager of the Louisville Gas & Electric Company, in a letter to E. L. Callahan, new-business manager of all the Byllesby properties. Mr. Montgomery's suggestion is that by working through the Electric Vehicle Association of America it would be feasible to set aside some certain day, preferably a holiday, as Electric Vehicle Day, to be observed in every center by parades of electrically driven vehicles. Prizes could be offered by the central stations in the various cities and other concerns interested in such demonstrations for the best decorated trucks and electric passenger cars. The public would get an idea of the extent to which electric vehicles are in use and the advertisement would be most valuable. Mr. Montgomery has taken up with Mr. Callahan and with W. H. Hodge, publicity manager of the Byllesby interests, the proposal that such a demonstration be arranged for Louisville some time this year.

Electrics in England.

As illustrating the electric-vehicle movement that is now beginning in England it is mentioned that a parade of such vehicles arranged in connection with the Municipal Electrical Convention at Birmingham from June 15 to 20, included cars from five different firms. While this figure represents advance, it also shows how small is the number of firms handling "electrics" in England at present. The Electric Vehicle Committee is pursuing its work with enterprise under the care of Secretary Ayton. One of its latest announcements is to the effect that the accumulator makers have decided in favor of standardizing a plate for electric-vehicle batteries having dimensions of eight and five-eighths inches by five and three-quarters inches, with lug centers four and three-eighths inches. Standardization of sizes of cells is also under consideration. Fifty-one municipal electric supply undertakings and three companies have agreed to a rate of one penny per unit or less for "off-peak" charging. As to the position of the plug receptacle on the vehicle it is recommended that this be fixed under the driver's seat preferably with the plug pointing upwards so as to make it impossible for the driver to take his seat without noticing that the charging connection is attached to the vehicle. Serious damage has been caused by a driver starting his vehicle without disconnecting the charging plug.

Marconi Annual Report.

TheInternational Convention on Safety of Life at Sea signed in January stipulates that wireless shall be compulsory for ships carrying 50 or more persons including crew. Those who work upon the smaller vessels were loud in their demands for similar rules to secure their safety.

The directors of the International Marine Marconi Company, alluding to the matter in their annual report, say that the convention stipulation can only be regarded as a step in the direction of compulsory service. "Apart from the necessity of providing so valuable a life-saving apparatus for those employed upon the smaller craft it is obvious that when misfortune befalls a large vessel, every small boat within the radius of a wireless call should be capable of being summoned to immediate aid. Had this been the practice in recent years many more thousands of valuable lives would have been saved." The company last year increased the number of telegraph stations owned and operated by it as public telegraph stations on the high seas from 580 to 788; the total is now 873. There are about 2,000 ships of different nations, exclusive of ships of war, fitted with Marconi stations.

H. H. Scott.

Holton H. Scott, elected president of the National Electric Light Association at its recent convention at Philadelphia, is one of the youngest men elevated to that position of eminence. Mr. Scott has had a wide experience in central-station practice in all of its departments, and brings to his present position an intimate knowledge of executive, engineering and operating phases of the work.

Mr. Scott was born in Orillia, Canada, September 14, 1874. With his parents he moved to Ashland, Wis., in 1882, where he received his early education and was graduated from the Ashland High School in 1892. He was graduated from the University of Wisconsin with the degree of Bachelor of Science in 1896. Immediately thereafter he entered the employ of Henry L. Doherty & Company, then connected with the Emerson McMillin Company. He was connected with the Madison (Wis.) Gas & Electric Company in general central-station work, becoming superintendent of the Lincoln (Neb.) Gas & Electric Light Company four years later. In 1902 he went to San Antonio, Tex., as engineer for the San Antonio Gas & Electric Company and the San Antonio Traction Company. Later on he became general superintendent of the former and assistant to the president of the latter. Both companies at that time were a part of the American Light & Traction Company. He returned to Madison in the spring of 1905 as general superintendent of the Madison Gas & Electric Company. In 1906 he went to New York as chief engineer for Henry L. Doherty & Company, being engaged in the examination of all the properties taken over and owned by that company. Mr. Scott is now general manager of the Doherty Operating Company, operating 104 public-utility plants in all parts of the country. He is a director in many of the corporations owned and controlled by Henry L. Doherty & Company.

Mr. Scott has been vice-president of the National Electric Light Association for two years. As chairman of the Organization Committee of the Association he has rendered a most effective and remarkable service in increasing the membership in every department. During the five years in which he has been chairman of the Organization Committee the list of members increased from 3,000 to over 13,000.

Mr. Scott is also a member of the National Commercial Gas Association, the New York Electrical Society, an associate of the American Institute of Electrical Engineers, a member of the Engineers Club of New York, and an honorary member of Tau Beta Pi.

Holton Henry Scott,
President of the National Electric Light Association.

Hocking Power Company Will Secure Power from Floodwood Plant.

A new electric company, with headquarters at Columbus, O., has been formed to market the power which will be generated by the big central station now under construction at Floodwood, O., in the Hocking Valley. It will be known, at least temporarily, as the Hocking Power Company. The name is taken from an old property already in operation in the valley, located at Nelsonville, which has been acquired as a measure of expediency. The president of the organization is Howard Manington, for some time past assistant to the president of the Mahoning & Shenango Railway & Light Company, at Youngstown, O., but whose home is in Columbus. John Poston, son of the president of the New York Coal Company, Columbus, which owns 11,000 acres of coal lands in the valley, is secretary and treasurer. G. H. Gampers, formerly superintendent of the Columbus Municipal Electric Light Plant of Columbus, and later in the employ of the city of Erie, Pa., is general manager and electrical engineer.

Close Brothers, of London, England, are the owners of the Floodwood plant. The power house immediately adjoins a 1,000-acre tract of coal land which has been their property for a number of years, and on which they have had mines. This station is said to be the only one in the state, if not in the country, where coal will be fed from the mine into the furnaces without handling, coming direct from the tipple by gravity. This unusual physical advantage with respect to the seam is further supplemented by a plentiful supply of water from the Hocking River, upon whose bank the plant is located, at a point insured from future contamination by mine waste. It is stated that this parent company, of which the Columbus organization is an independent branch, will be incorporated under the name of the Ohio Electrical Securities Company, with a capital of $2,500,000.

The first unit of the plant is expected to be in operation by November 1 of the present year. The Hocking Power Company has either municipal or private contracts signed up at Middleport, Pomeroy, Nelsonville, Buchtel, Murray City, Jacksonville, Trimble and Chauncey. The first two points are on the Ohio River, some 30 miles from the plant. It is the purpose ultimately to reach Columbus, lying 70 miles north.

Close Brothers have offices in Chicago in the new Conway Building. F. C. Elliott, the American representative of these financiers, is in charge.

Electric Power at Hull New Dock.

On June 26 there was opened a great joint dock undertaking at Hull, England, which has involved an outlay of $15,000,000 and has taken eight years to construct, excavate and equip. The opening ceremony was performed by King George. The whole of the power used for the pumping services and for the 53 cranes ranging from 1.5 to 80 tons in lifting capacity, which operate along the quays and over the extensive coaling berths, is electrical. It is the finest in England.

International Engineering Congress, 1915.

As already announced in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, an International Engineering Congress will be held in connection with the Panama-Pacific International Exposition at San Francisco, Cal. The dates for this have now been announced as from September 20 to 25, 1915. The sessions will be held in the new million-dollar auditorium now being built in the civic center of San Francisco. The main hall of this structure has a seating capacity of 10,000; eleven minor halls in this convention building will be available for the use of section meetings.

Present indications are that this Congress will be the meeting place of the largest body of distinguished engineers ever gathered in one place. George W. Goethals has accepted the office of honorary president. Colonel Goethals will himself preside over many of the sessions, particularly those dealing with the discussion of the construction of the Panama Canal, which will form one of the main engineering topics to be discussed. This subject will be treated under 22 separate headings relating to various details of the canal construction and operation.

Over 80,000 invitations to attend the Congress have been issued and in response thereto it is believed that several thousand civil, mining, mechanical, electrical, marine, naval and military engineers from nearly 40 different nations will attend the Congress. The Congress will be conducted under the immediate auspices of five engineering associations, viz., the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the Society of Naval Architects and Marine Engineers. The Congress will be divided into 11 sections, the reports of which will fill 11 large volumes. The program for one of these sections, that dealing with the construction of the Panama Canal, as already alluded to above, has already been prepared. Programs for the other 10 sections will soon be announced.

Street Lighting in Bombay, India.

The municipality of Bombay has decided upon the plan of making practical tests as to the relative merits of gas and electricity for street lighting in this city. The city at present is lighted partly by oil lamps and partly by gas lamps. There are many complaints of inadequate lighting of some of the streets, especially those where oil lamps are used.

The experiments, which are to start within about six months, or as soon as necessary installations can be completed on a few main streets now very poorly lighted by oil, will demonstrate the comparative possibilities of the two methods of illumination by gas and by electricity under practically identical conditions. In certain cases experiments will be conducted side by side in the same street, so as to render comparisons easy.

The commissioner of the municipality has arranged with the Bombay Electric Supply & Tramways Company and the Bombay Gas Company to carry out experiments. These two companies, interested in electricity and gas, respectively, are prepared to undertake the installation at their own risk and cost, provided that if their installation is eventually accepted the municipality will make due payment for it, and also enter into lighting contracts for a period of at least 15 years.

There are not many cities in India which have such advantages for the generation of electricity as Bombay has in the cheap water power which exists in its vicinity.

Course in Telephony in Texas Agricultural and Mechanical College.

Interest has been aroused in telephone circles by the announcement of the Texas State Agricultural and Mechanical College, which is located at College Station, Tex., that it has added a short course in telephony to the regular instruction of the institution. The course will be of one year duration and will be in charge of Professor F. C. Bolton of the Department of Electrical Engineering.

The course in telephony is intended for the young man who wishes to make an intensive theoretical and practical study of the equipment used in telephony. The course begins with a study of the principles of electricity and magnetism, including such principles of alternating currents as are directly applicable to telephony. The various parts of the telephone, the distributing frames and switchboard will be studied. A detailed study of the principles of the design of a plant and the methods of testing circuits will be made and instruction given on all problems which are met in telephony. Lectures by experts from the commercial field will augment the regular course of study.

Before announcing the new course Professor Bolton took the matter up with representatives of the telephone companies in Texas and was assured of their co-operation in the new work to be undertaken.

Two other new courses will be offered at the college, these being a two-year course in electrical engineering and another in mechanical engineering for power-plant operators.

Annual Convention of the Association of Iron and Steel Electrical Engineers.

The eighth annual convention of the Association of Iron and Steel Electrical Engineers will be held at the Hotel Statler, Cleveland, O., September 14 to 19, 1914. The following papers will be presented: "Some Electrical Problems Practically Considered," by B. G. Lamme; "Statistical Data of Electrical Application in the Iron and Steel Industry," by R. Tschentscher; "Applications of Auxiliary Apparatus in Iron and Steel Mills," by Stewart C. Coey; "Load and Use Factors as Applied to Motor Installations," by H. M. Gassman; "A Synchronous-Condenser Installation for Power-Factor Correction and Voltage Regulation," by W. O. Oschmann; "The Apprenticeship System as Applied to Steel Mills," by B. W. Gibson: "Cables and Accessories," by J. C. Bowman; "Underground Transmission in a Steel Plant," by F. D. Egan; "Hot Metal Cranes for Steel-Mill Service," by R. J. Mullally; "The Control of Induction Motors for Rolling-Mill Drive," by Wilfred Sykes and G. E. Stoltz; "Magnetic-Control Characteristics," by H. F. Stratton; "Alternating-Current and Direct-Current Magnetic Controllers for Auxiliary Motors," by W. O. Lum; "Switchboard and Switching for Steel Mills," by Saul Lavine; "Machine-Tool Drives," by Charles Fair; "Condensers and Their Auxiliaries," by P. N. Ehrhart; "Silent-Chain Power Transmission," by F. L. Morse; "Organized Safety," by L. R. Palmer; "High-Candlepower Incandescent Lamps for Steel-Mill Illumination," by G. H. Stickney and A. B. O'Day; "Power-Transformer Construction for Steel Mills," by G. A. Waters; "Watt-Hour and Ampere-Hour Meters and Their Application in Steel Mills," by R. C. Lanphier; "The Flaming-Arc Lamp in the Iron and Steel Industry," by Allen T. Baldwin.

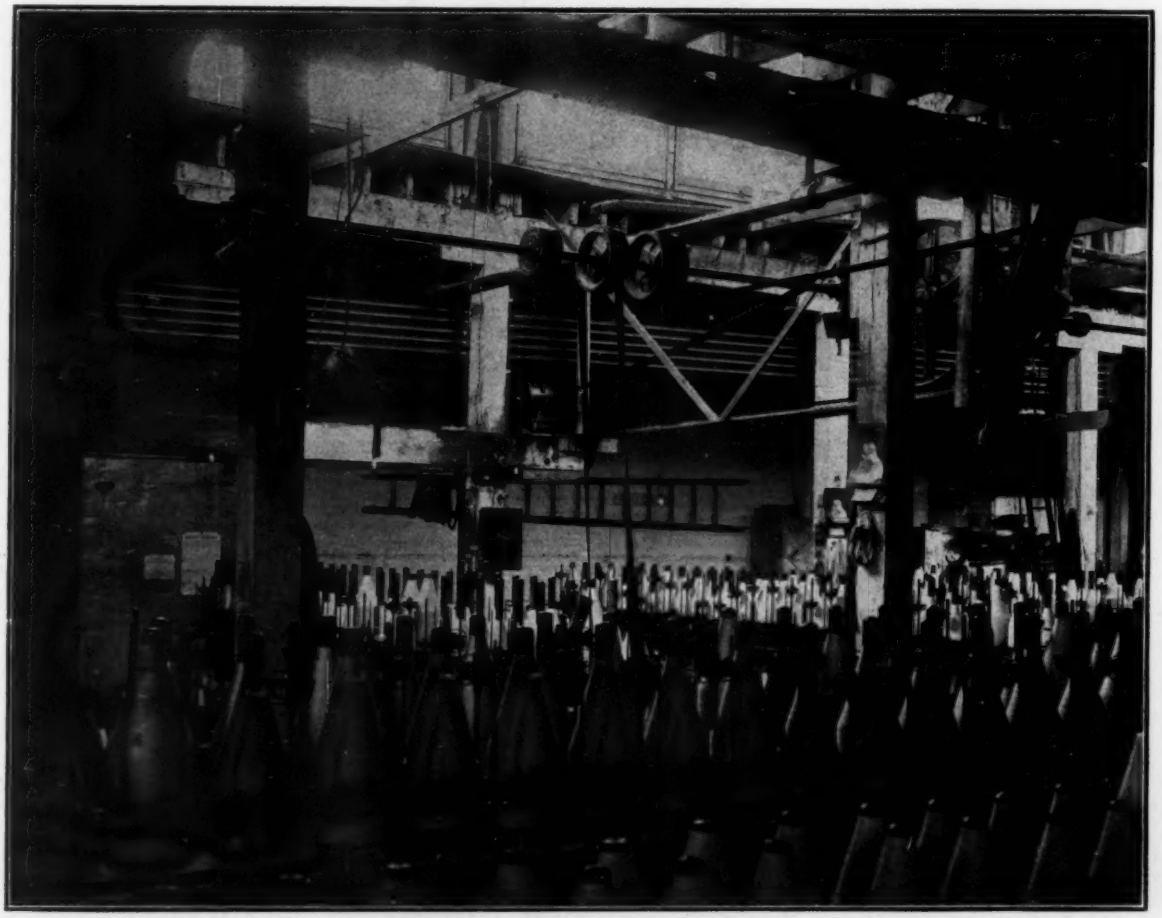
New Austrian Electric Plant.

At the recent session in Bregenz of the Vorarlberg Water Power Committee, the manager of the municipal electrical works reported on the projected works to be erected at Mengbach near Nenzing. They are to have a capacity of 12,000 horsepower, or sufficient for about 10 years, and will supply the municipal works both at Feldkirch and Bludenz. In the estimate a conduit cable line from Hohenems to Bludenz with an initial potential of 25,000 volts and afterwards of 50,000 volts is provided for. The total cost of the plant will be $800,000. Inquiries should be addressed in German to the Vorarlberger Wasserkraftkomite, Bregenz, Vorarlberg, Austria.

Electricity In Woolen Mills.

Although the use of electric service in woolen mills is not as general as in cotton mills, there is an ever increasing tendency on the part of operators to substitute central-station power for the less economical mechanical drives. A very complete report on a change over from isolated plant to purchased power in the case of a prominent New England mill is given in this article.

Very few, outside of the textile field, realize the rapidity with which electricity is becoming popularized in every branch of cloth manufacture. Considerably over half a million horsepower in electric motors are today in service in this country in the operation of textile mills of every type. Woolen and worsted mills have not kept abreast of cotton mills in the matter of electrification and, because of this, there is before the electrical manufacturer and central-station company a most attractive opportunity for the displacement of the relatively inefficient motive powers of steam and water in many existing mills, combined with the design of new installations for electric driving from the first. Much of the experience gained at considerable expense of time and money in the cotton industry is now available in the woolen field.



Group of Motor-Driven Winding Frames in Woolen Mill.

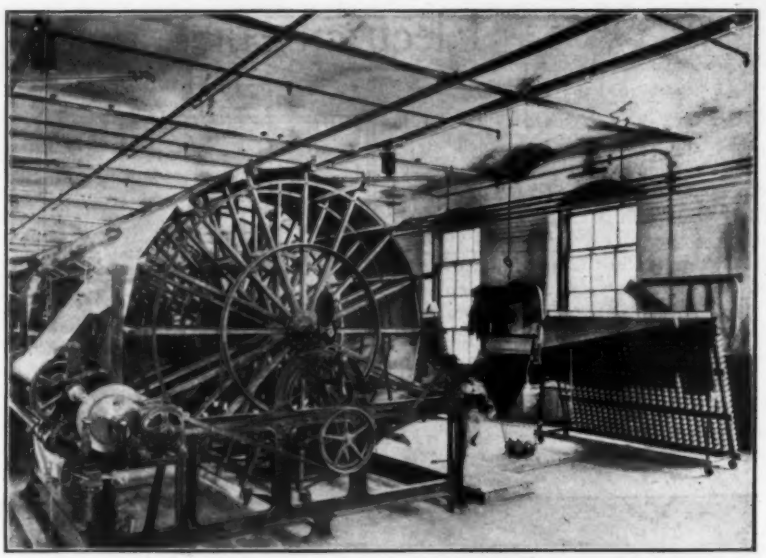
At practically every stage of the process of woolen and worsted-cloth production electricity forms an invaluable aid to the maintenance of steady working conditions. An outline of the principal steps in woolen-mill service discloses nothing which presents extreme difficulty of power application, and shows the attractiveness of the field of electrical service in mills which have taken it up.

The following description of the processes in woolen cloth manufacturing are taken from a treatise on woolen mills prepared by H. S. Knowlton:

Wool in the grease when received at the mill is first dusted, to remove dust and dirt; it is then scoured, to remove grease, discolorations, etc. In small mills these operations are performed by hand, but in large mills dusting and scouring machines are used. These machines usually are run at constant speed, requiring a simple motor installation without speed regulating apparatus, and hence the induction motor with the squirrel-cage winding is particularly successful in this department. Where the dusting and scouring machines are equipped with automatic feeding mechanisms it is desirable to install a motor regulator capable of giving a speed range, so that the amount of wool fed to the machines can be closely and easily controlled. After scouring, the wool is placed in centri-

fugal extractors which remove the water. These are also constant speed machines, and are specially adapted to direct driving by motors of the waterproof type. The starting rheostats required by this service are equipped with moisture-proof resistance elements in the best practice. Unlike cotton, wool is incapable of being worked into yarn without being thoroughly cleansed of its impurities. These impurities consist of greasy and sweaty secretions of the character of a fiber lubricant. Combined with dirt, sand, etc., they form an encrusting compound called yolk, which acts as a natural preservative to the wool, keeping it soft and pliable. This compound, with other extraneous matter, must be removed before the wool is in a workable condition.

From the extractors the wool goes to the dryers. These are sometimes in the form of screen tables, and sometimes in the form of belt conveyors. The theory which underlies the drying process is that dry air is capable of absorbing moisture from wet wool. For continuous drying a free circulation is a necessity, otherwise the air quickly becomes saturated and incapable of further service. Whether the air used in dryers is warmed or not, the motor-driven fan forms a valuable adjunct to the drying apparatus. The motor-driven fan is also employed to open out the fibers of the wool itself while drying, to secure an improved exposure to the circulating currents. Speed regulation of dryer motors is frequently desirable, particularly where belt conveyors are used, since the quantity of moisture present is likely to be somewhat variable, and a flexible means of controlling the air supply and also the movement of the feed to the dryer is provided by modern motor regulating devices. After being scoured, the wool generally has to be oiled before it is ready for spinning, blending, etc. As the oil is expensive, it is necessary to distribute it evenly and with economy of use. Various forms of oiling apparatus have been invented which spray the oil in a fine sprinkler over the wool, the latter being carried under the sprinkler by an endless cloth or belt.

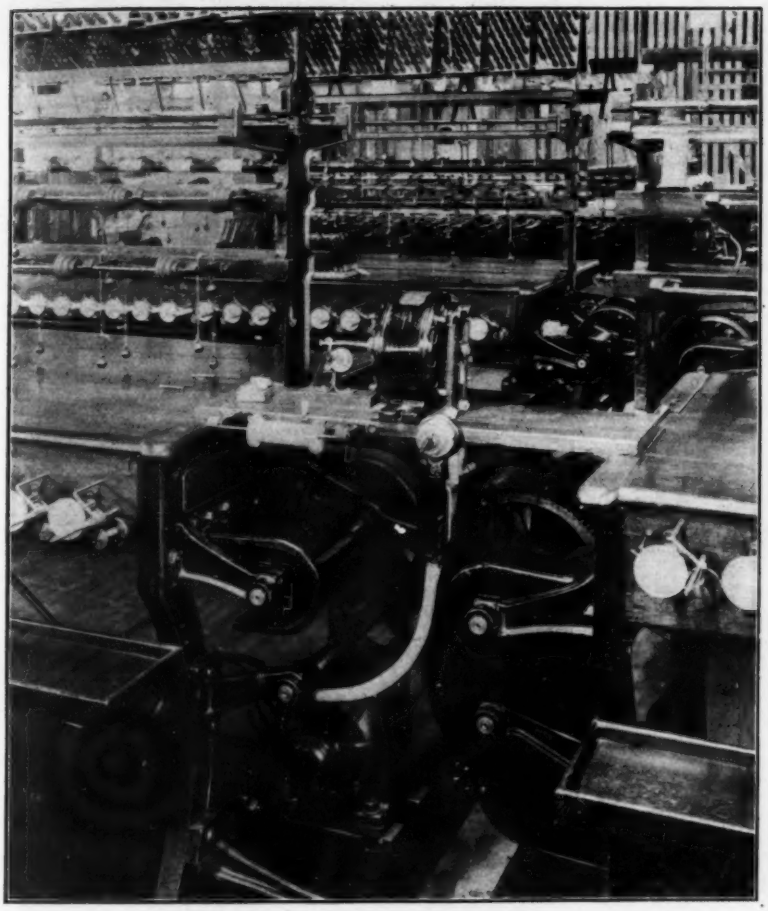


Warper Driven by Three-Horsepower Motor.

If the wool is to be woven in its natural state—undyed—it is next passed to the card room, whence burrs, seeds, leaves and other foreign matter are removed by machines known as burr pickers. These pickers operate on much the same principle as the cotton gin, and are equipped with fans to loosen up the fibers and blow out the accumulated dirt. Automatic feed is used with burr pickers. From the burr picker the wool is blown by air blast through pipes into an adjoining room, where it is deposited in a mixing picker, a constant-speed machine on which, however, automatic feed with adjustable speed is often used. The mixing picker mixes different grades of wool, or wool of different colors, if dyed wool is employed, and is frequently designed to supply the oil spray above noted, since the wool becomes so dry and stiff by the time it reaches the mixing picker that it could not be carded readily unless moistened.

The first step in the manufacture of worsted yarn is to pass the washed wool through a worsted card, which consists of a number of cylinders covered with fine wire teeth mounted on a frame. The effect of these cylinders on the wool is to disengage the fibers, make them straight and form a so-called "sliver" or strand. Old type carding machines consist of first and second breakers and the finishers are often driven by one motor, and both breakers are combined in one machine. An automatic feed is used with the first breaker, indicating the desirability of motor speed regulation. The two breakers and the finisher are often driven by one motor, and speed regulation is desirable. The carding machine combs the wool out and gives the fibers a slight twist, resulting in a large loose cable called the "roving." The second breaker twists the roving into a smaller cable, with a further combing, and the finisher opens the wool once more and twists it into final cable form ready for spinning. On leaving the finisher the roving is automatically wound on spools. The spools of rovings are taken to the spinning room, where they are put on either

Looms Driven by Individual Motors.



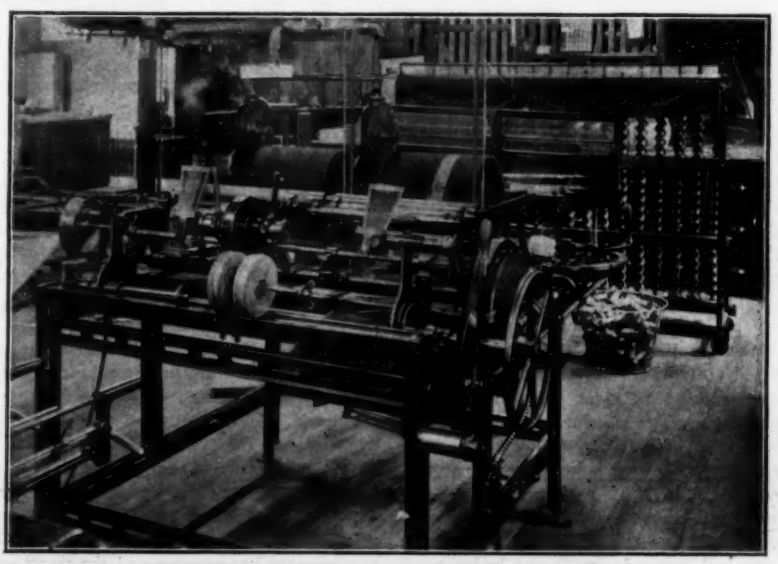
Spoolers Driven By Two-Horsepower Motor.

mule spinning frames or jack spinning frames. These machines spin out the roving into yarn and wind it on bobbins. Spinning machines are operated at constant speed. The yarn is of two kinds, tight spun yarn for the warp and yarn spun more loosely for the filler. Yarn designed for the filler is left on the bobbins, and that designed for the warp is reeled off the bobbins upon spools, the operation being performed by a spooling machine. From the spooling machine the warp goes to the dresser which lays the warp, smoothing down the fiber. The warp is next wound upon the warp beam, the latter being revolved by a constant-speed motor and after being wound on the beam, the warp is threaded through the frames and then placed in the loom for weaving.

After yarn is woven into cloth it is taken to the wet finishing room, where it is passed through the fulling mills. This is a felting process in which the cloth is shrunk, frequently from a width of 72 to 56 inches. Small constant-speed motors are used to drive the fulling mills, and, on account of the moisture, rheostats with waterproof resistance coils or strips, are desirable. From the fulling mills the cloth passes to the washer, which is also a constant-speed machine. The cloth is then dried by passing it through a centrifugal motor-driven extractor and then through a dryer consisting of motor-driven cylinders heated by a steam supply. Next the cloth passes to the finishing room. If it is to have a nap left upon it, it passes first through a "gig," which, by means of a revolving cylinder equipped with small projecting spikes, lifts up the nap. The gig requires a constant speed motor. From the gig the cloth goes to the shear, a machine with a revolving spiral knife which trims the nap to an even length. The fiber cut off in the shearing process is known as a flox, and as this is abundantly scattered about, it renders the use of inclosed motors and rheostats desirable.

The next step in the process takes the cloth to a rotary press for steaming and pressing. The steaming completes the shrinking process, which has progressed with each moistening of the cloth, and the pressing puts on the final finish. Rough finished cloths, such as beavers and semi-beavers, are not pressed. Finally, the completed cloth goes to the perch room, where it is first inspected and then measured and rolled up by a constant-speed machine. The motor operating the rolling-up machine should be capable of being stopped quickly to enable the operator to catch the end of the piece, thus indicating the desirability of dynamic braking.

If dyeing is done in the wool, the raw material to be dyed is usually placed in vats and poled around by hand. If dyed in the piece, the cloth after being woven is arranged in the form of an endless belt over a revolving drum, so that it passes again and again through a vat placed beneath the drum. For operating the drum a constant-speed motor is used, requiring only a starting box, which, however, should be of the moisture-proof type.



Warp Frame Driven by Three-Horsepower Motor.

No machine in the weaving of wool or worsted requires large power. In general the power requirements are slightly greater than in the weaving of cotton. As in cotton weaving, it is most important that a constant speed shall be maintained, and here the electric drive possesses great advantages over all other motive powers.

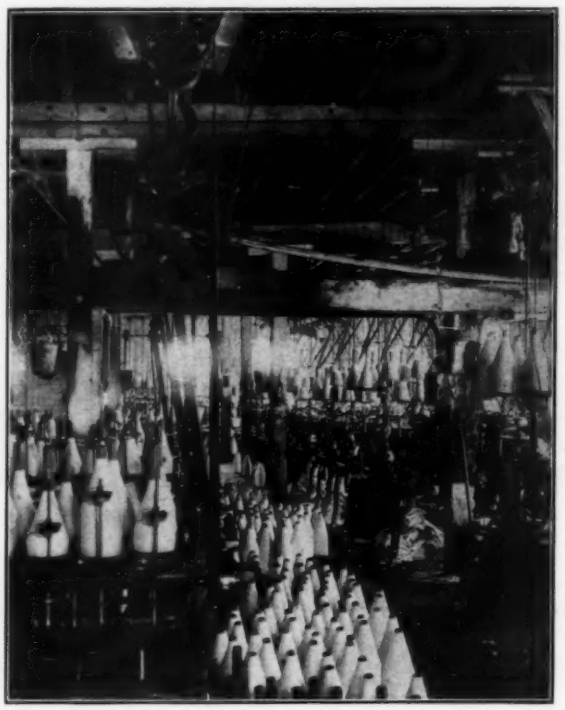
Conditions as encountered when soliciting the adoption of central-station service by woolen mills are best illustrated by a description of a plant changing over from isolated-plant to purchased power. The plant in question is located in Massachusetts and manufactures a high grade of men's and women's suitings.

Previous to the first of the present year the power for driving the plant was furnished entirely by steam. Two 50-horsepower engines turned the machinery in the four-story frame building and long shafting extended between and through the other buildings. Indicator cards on these engines showed on an average power demand between 100 and 125 horsepower before changing to electric drive. In the boiler room were three Cunningham Iron Company 1905-model boilers, rated at 100 horsepower each. While on engine drive all three were in operation and the average amount of coal consumed was about 36 tons per week. At the present time only two boilers are in use and about 24 tons of coal are burned per week. The best grade of Pocahontas coal is burned. The coal is hauled from cars and dumped outside the boiler room and wheeled in and dumped in front of the boilers. Previous to change from engine to electric-motor drive, the steam demand was from the dye house and seven engines, two 50-horsepower for power, another smaller one also for power, three on driers and heaters and one direct-connected to a 25-kilowatt generator for lights. At present the steam is used as before in the dye house, for the three engines driving driers and heaters, and the engine on the generator, and steam heating. The two large mills are heated by steam as also the office building and picker room. Previous to the change to electric drive three men were employed in the boiler house while at present only one is necessary. Boiler pressure is maintained at about 100 pounds at the boilers.

In changing to electric drive the two 50-horsepower engines in the main building were shut down and the group system was established, the shafting being cut and the motors mounted on the ceiling and arranged to drive the various segments and departments. Machinery with motor drive has also been made possible in other outside buildings, as, for instance, a small building has three sets of circular knitting machines, and another building has ten upright knitting machines. No individual drive was attempted with the exception of a 10-horsepower motor driving a blower for exhausting nap from the napping machines. The average size of motors installed at present is 9 horsepower, the largest motor being 20 horsepower and the smallest 2 horsepower with the exception of two one-fifth-horsepower single-phase motors on sewing machines which are not included in this report, as well as a small Eastman direct-current direct-connected machine used for cutting cloth. Direct current is furnished to this motor by a small generator driven from the line shafting of the five-horsepower motor in the basement of the main building supplying current at 125 volts.

The current for driving the motors at this plant is 220 volts, two-phase, 60 cycles. The current is transmitted a distance of eight miles at 13,200 volts and four miles at 2,200 volts, and is stepped down at the mill through two 50-kilowatt transformers to 220 volts. The motors are all started by means of autostarters with the exception of sizes below 7.5 horsepower, which are thrown directly on the line. In some cases short-circuiting switches are used to relieve the autostarters after motors are in the running position.

Motor-Driven Winders.



Motor-Driven Spoolers.

There is installed throughout the plant at the present time 154.5 horsepower in motors which is divided up in the various departments as follows:

Department.	Horsepower Installed.
Picker	15
Carding	20
Spinning	25
Weaving	30
Dye House	25
Loom Finish	5
Napping	20
Circular Knitting	7.5
Knitting	2
Cutting Department	5
Total	154.5

The plant can be divided into two parts

(Continued on page 68)

Woolen Mill Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Woolen mill located in Eastern Massachusetts manufacturing a high grade of men's and women's suitings. There are 155 employees working 10 hours per day.

Total connected horsepower, 154.5. Total number of motors installed, 15. Average kilowatt-hours per month, 14,740.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	12,900	May	19,700	September	14,100
February	11,300	June	13,900	October	14,900
March	15,000	July	13,400	November	15,800
April	11,400	August	20,700	December	13,800

Load-factor, 17.4 per cent; operating-time load-factor, 41.8 per cent.

The average material handled is 1,000 pounds of wool per day. The average consumption per yard of cloth woven is 0.17 kilowatt-hour.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	1,120	Belted to a 25-foot four-hanger line shaft driving one S. R. Parkhurst double-cylinder fiber opening and cleaning picker with Harwood feeder. Speed of countershaft 450 revolutions per minute. Capacity 200 pounds per hour. One Davis & Furber Machine Company model 1903 mixer picker, consisting of one head 24 by 34 inches and two sets of feeding cylinders and apron 32 inches wide. This machine is hand feed. Speed of head is 1,008 revolutions per minute.
1	20	1,120	Belted to a 10-foot two-hanger shaft with 260 feet of countershafting, 30 hangers, driving eight sets of Davis & Furber wool cards, model 1880, each set consisting of: one breaker card with five workers and strippers and main cylinder 48 by 48 inches with Bramwell automatic weigher and feeder. Cylinder speed 83 revolutions per minute. One intermediate card with five workers and strippers and main cylinder 48 by 48 inches. One finisher card with two doffers, four workers and strippers. There is also a large screen for taking dust out of the waste that can be belted to this motor. It is run only 2 or 3 hours per week.
1	10	850	Belted to a six-foot two-hanger shaft with nine feet of countershafting, three hangers, driving four Davis & Furber mules 240 spindles each.
1	7.5	1,120	Belted to a six-foot two-hanger shaft with eight feet of countershafting, three hangers, driving three Davis & Furber 240-spindle mules.
1	7.5	1,120	Belted to a five-foot two-hanger shaft and nine feet of countershafting, three hangers, driving two Davis & Furber mules, 240 spindles each.
1	10	850	Belted to a 10-foot two-hanger shaft with 95 feet of countershafting, 15 hangers, driving six Crompton & Knowles 90-inch looms with 20 harnesses and four boxes on the lay, weaving goods averaging 72 inches wide 34 picks per inch. The average number of harnesses in use is 13 and the average number of boxes 3. The average number of picks per minute is 89. Eight L. J. Knowles 90-inch looms with 12 harnesses and three boxes on the lay. Weaves goods 72 inches wide. The average number of harnesses in use is 10. The average number of picks per minute is 92. One Buffalo Forge Company No. 4 blower for exhausting the spare roving on the condenser cards.
1	10	1,120	Belted to a 10-foot two-hanger shaft with 78 feet of countershafting, 13 hangers, driving 18 L. J. Knowles 90-inch looms, with 12 harnesses; one 18-inch lathe; one 12-inch lathe; one grindstone 22 inches by three inches; one 78-spindle winder; and one Davis & Furber warp spooler.
1	5	1,730	Belted to an eight-foot two-hanger shaft with 50 feet of countershafting, 12 hangers, driving two Davis & Furber dressing frames for dressing and arranging the proper lay of warp with geared arrangement for beaming both at once if necessary. Three Davis & Furber warp spoolers. One Holmes-Blanchard freight elevator serving basement and three stories. Capacity about 1,000 pounds. One direct-current generator, 125 volts at 2,000 revolutions per minute for supplying current for cutting machine motor. Seldom used.
1	15	850	Belted to a 10-foot two-hanger shaft with 120 feet of countershafting, driving three D. R. Kenyon & Son fulling mills; one 24-inch B. F. Sturtevant blower, 900 revolutions per minute; three 40-inch hydro-extractors; one soaping machine; one yard dyeing machine and three 8-piece dyeing machines.
1	15	1,200	Belted to a six-foot two-hanger shaft with 216 feet of countershafting, 28 hangers, driving five large-piece dyeing tubs; three small-piece dyeing tubs; three washing machines; two wringing machines; one small pump; and one Parks & Woolson steaming machine.

Woolen Mill Data—Sheet No. 2.

MOTOR INSTALLATION, continued.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,120	Belted to a five-foot two-hanger shaft with 65 feet of countershafting, 14 hangers, driving one tacking machine; one Davis & Furber napping machine, 14 rolls, 78 inches wide; one pressing machine; one shaving machine; one measuring machine; one winder; one brushing machine; and two 30-inch ventilating fans.
1	10	850	Belted to a 24-foot shaft, four hangers, with 32 feet of countershafting, 16 hangers, driving one Davis & Furber 20-roll automatic double-acting napping machine; six Davis & Furber 16-inch single-cylinder 66-inch nappers; four Kenyon ripple machines; and one B. S. Roy brush-grinding machine.
1	10	1,200	Belted to a four-foot, two-hanger shaft driving one B. F. Sturtevant 33-inch blower for exhausting the seven napping machines. Speed, 1,108 revolutions per minute.
1	7.5	1,120	Belted to a six-foot two-hanger shaft with 70 feet of countershafting, 20 hangers, driving 16 30-inch spring-needle circular knitting machines running at 48 revolutions per minute, made by the Crane Manufacturing Company; 10 18-inch Crane spring-needle circular knitting machines running at 28 revolutions per minute; and 12 George W. Payne Company spoolers for knitting machines, 24 spoolers each.
1	2	1,800	Belted to a five-foot two-hanger shaft with 10 feet of countershafting, four hangers, driving six 30-inch Crane spring-needle circular knitting machines; and two Payne spoolers, 24 spools each.
1	5	1,800	Belted to a five-foot two-hanger shaft with 65 feet of countershafting, 20 hangers, driving 10 8-foot upright knitting machines; two Payne & Mathews skein winders; and two upright spoolers, 40 spools each.

Woolen mill located in Massachusetts. Running hours per week, 60.

Total connected horsepower, 160. Total number of motors installed, 10. Average kilowatt-hours per month, 12,702.

Kilowatt-hour consumption for 12 months: January, 11,805; February, 11,994; March, 13,223; April, 11,881; May, 12,766; June, 12,440; July, 12,839; August, 13,382; September, 14,637; October, 12,738; November, 13,364; December, 11,351.

Load-factor, 14 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	50	900	Belted to a line shaft driving eight cloth fulling mills; four cloth washers; one wet brush; and one calender roll.
1	15	1,200	Belted to a line shaft driving seven kettles; two padding machines; one steaming machine; and one elevator.
1	20	1,200	Belted to a line shaft driving rag pickers.
1	35	1,200	Belted to a line shaft driving four mixing pickers, double-cylinder 48-inch; two burr pickers, double-cylinder 48-inch; and four blowers.
1	5	1,200	Belted to a line shaft driving two nappers; and one gig.
1	5	1,200	Belted to a line shaft driving one press; and two shears.
1	7.5	1,200	Belted to a line shaft driving three grinders; one pad cutter; one roller press; one knife cutter; and four screw presses.
1	2	1,200	Belted to a line shaft driving one drying machine; and one folder.
1	0.5	1,800	Driving two measuring machines.
1	20	1,200	Belted to a line shaft driving five 48-inch breaker cards; one crosser; and one horizontal extractor.

namely the weaving and the knitting departments. The weaving is the greater part and employs more help and more horsepower in motors installed. There is 120 horsepower for the weaving and practically 34 horsepower for the knitting.

All the raw material from the pickers goes to the cards and to the mules. Some of the yarn spun is for the knitting machines and the rest for supplying material for the looms. Two mules were spinning for the knitting department and the remaining seven were spinning for the weaving. All the yarn woven and knit is not spun at this plant, as practically two-thirds is spun outside. Most of this is used in the knitting department for practically two-thirds of the yarn used here is cone-wound.

There is a 15-horsepower motor in the picker department. The average consumption per week is 202 kilowatt-hours, which gives a load-factor for the department of 27.4 per cent.

The average material handled is about 1,000 pounds per day, which is handled three times in many cases. If the stock is handled only once there will be about 6,000 pounds pass through the picker building in one week, which takes on an average 202 kilowatt-hours. This would be 29.7 pounds per kilowatt-hour and 0.0337 kilowatt-hour per pound of stock handled. However, if this material is handled three times instead of once as figured above, then the electrical consumption per pound of stock passing through machines would be reduced accordingly to one-third and 9.9 pounds of stock would pass through the pickers per kilowatt-hour.

There are three men employed in this department and oftentimes work is extended throughout the noon hour.

A 20-horsepower motor is installed in the carding department, which has an average current consumption per week of 618 kilowatt-hours, giving a load-factor

for the carding department of 62.8 per cent. About 1,000 pounds of material are carded per day on an average, which would be 9.7 pounds per kilowatt-hour or 0.103 kilowatt-hour per pound of material carded. The electrical consumption is therefore three times as great as is required in the picker department for the same amount of material handled, not considering the waste.

This card-room load is a steady one and the reason that the load-factor is so low is because of the fact that the motor is not fully loaded even with all cards running.

There is a Buffalo forge blower No. 4 belted to the line shaft driven by the 10-horsepower motor in the weave room which blows the two waste ends on the condenser cards back to the feed to the breakers. The power to run this blower should be charged to the card room but is neglected in this report. However, it is liable to be of some concern when the card room works overtime and the weave room does not because the 10-horsepower motor would have to be run especially for the blower.

The horsepower required in the spinning room fluctuates during the cycle of operation. The cycle consists of four periods: first, accelerating spindles and carriage; second, spinning and drawing with the rolls stopped; third, twisting; fourth, running in and winding. If the cycle is 14 seconds, the periods would probably average for the first period, 3 seconds; for the second period, 3 seconds; for the third, 5 seconds, and for the fourth period, 3 seconds, with a high peak when the first period starts lasting a fraction of a second.

The total horsepower installed in the spinning room is 25 to drive 10 mules with a total of 2,376 spindles besides the two small winders which do not take much power. This is an average of 95 spindles per horsepower installed.

The average kilowatt-hour consumption per week is 623, which gives a load-factor of 50.6 per cent.

The total horsepower installed in the weaving department and dressing room is 30 and there are 42 90-inch looms besides the two lathes and the dressing-room machines and elevator; of these there are 28 in operation and 16 looms are in operation on an average all the time. This is an efficiency of 60 per cent. The load-factor of this department is 56.5 per cent.

Each loom will weave on an average, 175 yards per week, at 34 picks per inch and 95 picks per minute. The maximum number of yards that could be woven in one week of 56 hours by one loom would be 260 yards. 175 yards is 67.3 per cent of 260 yards. As there are 28 looms in operation and each averages 175 yards per week the average output is 4,900 yards per week. The electrical consumption is 0.7 kilowatt-hour per yard of cloth or 5.9 yards per kilowatt-hour. At two cents per kilowatt-hour this would amount to 0.34 cent per yard.

The following is a comparison of the power costs before and after installing central-station service.

FORMER YEARLY COSTS.

Coal	$ 8,500
Oil, waste and supplies	425
Engineer	936
Fireman	780
Dumper	624
Total	$11,265

PRESENT YEARLY COSTS.

Cost of current	$ 3,747.48
Coal (1248 tons@4.50)	5,616.00
Fireman	780.00
Total	$10,143.48
Former Costs	$11,265.00
Present Costs	10,143.48
Yearly Saving	$ 1,121.52

It is apparent from the above that an annual saving of $1,121.52 was effected in this case, but this does not represent the total benefits as greatly increased production and improved quality of product are not taken into consideration.

Commercial Practice
Management, Rates, New Business

DEEP-WELL PUMPING BY ELECTRICITY.[1]

By H. G. Hall.[2]

The pumping of deep wells of the size necessary to supply systems of water works in cities and villages has always been a more or less expensive operation, owing to the trouble experienced in getting wells located near each other. It is not an uncommon occurrence for parties handling a project of this kind to be compelled to sink from six to ten holes before a suitable supply of water can be obtained, and then find that the wells are so far apart that the transmission of steam to operate the separate pumps is a very expensive proposition indeed. By deep wells, I have reference, of course, only to wells where the water does not rise above the suction limit. Therefore, the use of electricity for this work has solved a great many of the problems and owing to the high efficiency and flexibility of electrical apparatus has very materially reduced the cost of pumping.

I have known of instances where it was necessary to go miles from the center of distribution to find a suitable water supply and the cost of transporting the coal for steam pumps would alone cover 50 per cent of the cost of pumping by electricity.

The two most commonly used methods of pumping deep wells by electricity are the direct-plunger lift and the air shaft.

The air-lift method is used where the water vein, in which the well is located, is of such a nature that trouble is likely to be experienced from sand or other obstructions getting in the valves or cutting the leather packing of the pistons in the plunger type of pumps, and consists of inserting a pipe, connected to an air compressor, into the well below the surface of the water and forcing the air through this pipe which when freed under the water expands and rising lifts the water with it to the surface.

Where the direct-pressure system of water works is used, it is necessary to lift the water from the well to an open reservoir, in order to separate the air and water, and then pump it into the mains with centrifugal or reciprocating pumps.

The over-all efficiency of the air-lift method is rather low, especially where it is used in connection with the direct-pressure system of water works, as the water has to be handled twice and the cost of installation is high unless there are several wells so situated that one air-compressor plant and one pressure-pumping plant will be sufficient for all wells. Even under the most ideal conditions, it is seldom that the efficiency will reach 40 per cent and it is often as low as 20 per cent.

However, it is not the intention of the writer to go too deeply into the merits and disadvantages of the sever-

1 A paper, slightly condensed, presented before the Michigan Section, National Electric Light Association, June 18, 1914.

2 Division manager, Eastern Michigan Edison Company, Mount Clemens, Mich.

al methods, but to describe briefly an installation of deep-well pumps now in service in the village of Richmond, Macomb County, and operated by the Eastern Michigan Edison Company furnishing water to the waterworks system of that village.

The water supply is obtained from three deep wells; two have 12-inch casings and one has an 8-inch casing. These wells are 131 feet deep and the water normally rises to within 65 feet of the surface of the ground, but dropping to 95 feet when the pumps are in operation. The two 12-inch wells are located about 100 feet from the main water-works plant and are housed by one building, as the wells are only 25 feet from each other.

Before the Edison Company took over the operation of this plant, these wells were pumped with steam-driven vertical pump heads manufactured by the American Well Works Company. These steam heads were single-acting and connected with 5.75-inch double-acting working barrels with a 36-inch stroke and a rated capacity of 200 gallons per minute.

A motor-driven pump head manufactured by the American Well Works Company was substituted for the steam head on one of the 12-inch wells, and by using the same size working barrel and increasing the speed, to make up for the shortened stroke necessary in the design of motor-driven head, the same capacity was secured. This head is of the crank type and has a 24-inch stroke and operates at a speed of 25 strokes per minute. The motor is connected through a train of gears, and the entire mechanism is mounted on a common base with slide rails, so that it can be moved to one side to permit the drawing of the rods and drop pipes.

The motor is a General Electric slip-ring type, 25 horsepower, 1,200 revolutions per minute, and is operated from a three-phase, 220-volt circuit. The motor is equipped with an automatic starting contactor panel, which is actuated by a water-pressure governor. The motor and head were purchased large enough for use with a 7.75-inch working barrel, as it will only be a matter of a few years before the capacity of the plant will have to be increased, and all that is now necessary will be the purchase of a new working barrel and drop pipe.

The automatic starting equipment has proved very reliable and about all that is necessary in the care of this outfit is to keep the motor and pump supplied with oil. The leather packing rings on the pistons have to be renewed about every 60 or 90 days, but this is not a serious operation, as the complete head can be moved to one side, the rods and pistons removed, the leathers adjusted, and the whole operation completed by two men in about four hours.

The other 12-inch well is pumped with a Luitweiler non-pulsating, double-acting, motor-driven pump head manufactured by the Luitweiler Pumping Engine Company, and has a capacity of 200 gallons per minute. This machine has a 7.75-inch working barrel and operates at a speed of 22 revolutions per minute, and is driven by a 15-horsepower, 1,200-revolution per minute, slip-ring-type motor, hand-controlled. The pump head of this unit is particularly interesting, in that it is operated by cams, thereby eliminating the jar and vibration so noticeable in the crank motions. There are two sets of pistons and rods so connected to the cams, and balanced, that the water is in continuous motion at all times, making it particularly adaptable to motor drive and reducing maintenance to a minimum. The pistons are placed one above the other in the same working barrel, on separate rods, and are traveling in opposite directions at any one time, except for a slight overlap to allow one to pick up the load of the other, thus giving a continuous flow of water and requiring no counterweights in the gear or flywheels to distribute the load on the motor and also do away with the back lash, water hammer and noise so objectionable in the crank-type heads. The motor is geared to the cam shaft, the motor pinion being rawhide.

The steady motion furnished by the cam-operated pistons eliminates the greater portion of the trouble with leathers, as the sudden jar caused by the momentary stop and start on the dead center of the crank-type pump has as much as anything to do with the wear and oftentimes the stripping of the threads on the rods. This outfit has been in service about 11 months, and it has not as yet been necessary to renew the leathers put on the pistons when the pump was installed.

The automatically operated head is used for night service only, except in the hot months of the summer, when the sprinkling of lawns makes it necessary to run all the equipment for a few hours in the afternoon.

The 220-volt service to the pump-house is run underground and fed from three 20-kilowatt, single-phase transformers connected delta-delta through a switch to the 2,300-volt bus on the switchboard. We have spare cables drawn into the conduits and arranged on the ends with jumpers so that in case of cable trouble, the operator can change to another cable without the assistance of construction men. With delta-connected transformers we have capacity enough to run the pumps on two transformers connected in open delta, in case one should be disabled.

Each pump motor is fused, and the switch on the switchboard which controls the pump circuit has an automatic trip, so that in case the primary supply should be interrupted when the pumps were running and the attendant was not in the pump house, full voltage would not be thrown on the motor while it was standing still.

The remaining eight-inch well is equipped with one of the old-style steam heads and is used only in case of a serious interruption to our transmission lines which would leave the village without fire protection.

The water is all pumped into a reservoir 100 feet high and having a capacity of 87,000 gallons, so that under normal conditions the pumps have to work against a total static head of about 185 feet. The average daily production of the plant is 130,000 gallons, and in the winter months the greater part of the load is off-peak.

The conditions at this plant are somewhat different than in the ordinary water-works, inasmuch as approximately 50 per cent of the total water pumped is resold in bulk to the railroad company, and as the railroads use much more water in the winter than in the summer, the winter consumption of the plant is about as large as the summer. In the summer months the load laps over on our lighting peak as the reservoir is small compared to the daily consumption and the sprinkling of lawns makes it compulsory to run the pumps in the evening to maintain a pressure of 40 pounds at all times, as provided for in our contract.

We have interconnection with the deep-well pumps two fire pumps for furnishing high-pressure fire service. One of the pumps is a DeLaval 1,600-gallon-per-minute, two-stage, centrifugal pump direct-connected to a 125-horsepower, three-phase 2,300-volt, 1,700-revolution-per-minute motor. This unit has its suction connected to the reservoir and the discharge to the mains and we can maintain a pressure of 80 pounds at the plant for fires. We also have a Schaeffer & Dunberg 14-inch by 8.5-inch by 12-inch steam fire pump for emergency service in case of trouble with our transmission lines.

The entire plant, including our transformer substation for light and power service, is operated by one man who is on duty in the day time only, but subject to call at night in case of fire or the failure of the automatic apparatus to perform its duties. There is an alarm which is connected to register low or high pressure and ring

OVER-ALL EFFICIENCIES OF PUMPING UNITS IN RICHMOND WATER WORKS.

Luitweiler Pump (Electric).

	Capacity in gallons per minute	Total static head	Efficiency switchboard to reservoir
One-half Speed	96	180	39.6%
Three-fourths Speed	144	180	51.3%
Full Speed	208	180	66.1%
American Pump (Electric)			
One-half Speed	80	185	42.2%
Three-fourths Speed	131	185	52.2%
Full Speed	192	186	63.4%
American Pump (Steam).			
Full Speed	145	185	23.5%
Centrifugal Pump Equipment (Electric) at Armada.			
Full Speed		92	76.4%

PUMPING STATISTICS.

	Deep Well (Electric)	Deep Well (Steam)	Centrifugal (Electric)
Gallons pumped per day	124,031	146,750	14,484
Gallons pumped per kilowatt-hour	760	.....	1,282
Revenue per 1,000 gallons	$0.035	$0.035	$0.056
Revenue per kilowatt-hour	0.026	.....	0.071
Gallons pumped per pound of coal.	.....	39	.....
Revenue per horsepower-hour	.....	$0.0102	.....

a gong in the attendant's house, but as yet we have had no occasion to use it.

The above data are the results of some tests made on the different pumps, showing the efficiencies of the separate units under different conditions, together with a comparison with a centrifugal pumping station operated by this company. The centrifugal station is, of course, not used in connection with deep wells and these figures are only stated to show the comparative costs and efficiencies.

The rate for pumping at the deep-well plant is $0.035 per 1,000 gallons, with a minimum charge of $125.00 per month. The rate for pumping at the centrifugal plant is $0.05 per 1,000 gallons with a minimum charge of $25.00 per month. The reason that the average revenue per 1,000 gallons in the centrifugal plant is $0.056, is that there are several months in the year when the consumption does not cover the minimum charge.

We consider this class of business very desirable, inasmuch as it is usually all off-peak and builds up the load-factor. I realize that it is not very easy to get this business from the average village or city where they have municipally owned water-works, but it is worth a thorough investigation by central stations who already give 24-hour service, or are considering the same.

In the case of the deep well just described, the village has a contract with the railroad at a rate that earns them enough to about pay the total pumping expense, leaving the returns from their residence and store customers clear, with the exception of the cost of maintenance of the mains, fire hydrants, etc.

The total cost of the deep well and fire pumps installed was $6,841.72, and the Edison Company has the use of the water-works building for substation purposes during the life of the pumping contract. The village furnishes and maintains the wells and reservoir and the company, of course, maintains its own equipment.

Flatiron Campaign in Kansas City.

The specialty department of the Kansas City, Mo., Electric Light Company has had its hands full since it advertised a special sale on electric irons. Westinghouse irons, the usual price on which is $3, are being sold for $2.40 during the month of July. In addition, but one-third of this amount is payable immediately; the purchaser pays 80 cents a month until the iron is paid for. Many deposits were made prior to the opening of the sale on July 1.

Electric Irrigation Pumping in Utah.

For the purpose of determining the feasibility of irrigating land in the vicinity of Willard, Utah, by electrically operated pumps from deep wells, the Utah Power & Light Company has recently installed a demonstration well on the farm of A. A. Lemon at North Willard. A fairly good flow of water was struck at 46-foot depth and a hand pump demonstrated that the well had considerable capacity. An electrically operated pump was later installed and a flow of 75 gallons per minte was obtained without in any way reducing the appreciable supply of the well. The power company believes that a considerable acreage in the vicinity of Willard which does not now have a water right from the gravity ditches will be reclaimed by the installation of electrically operated pumps.

At Brigham City, about ten miles north of Salt Lake City, a large part of the valuable peach orchards were grown and are now cultivated by means of water obtained from electrically pumped wells. The municipal electric plant at Brigham City has established a very low rate for the power for operating these pumps, believing that the municipality would profit more from the highly productive orchards thus created than by charging a prohibitive rate for the power which would prevent its use.

The Utah Power & Light Company has purchased the power plant formerly owned by the Ogden Rapid Transit interests at Brigham City and this plant is now idle, owing to the fact that this company has considerable surplus of power. It is expected, however, that if the Utah Power & Light Company can develop a sufficient market for power for irrigation purposes in the vicinity, that it will resume the operation of the power plant here.

Electric Appliance Campaign in Southern Indiana.

A large number of Indiana homes will be equipped with electric washing machines, electric vacuum cleaners, electric irons and electric fans before the end of the campaign which the subsidiaries of the Interstate Public Service Company are making in connection with the Louisville, Ky., branch of the Federal Sign System (Electric). According to information from R. E. Brian, manager of the Louisville office, T. A. Elder, commercial manager of the Interstate Company, 510 Board of Trade Building, Indianapolis, has placed the following order with the Federal System:

For each of the ten companies named below, one Federal washing machine, to retail at $85; five Federal Junior electric suction cleaners, to retail at $37.50, and 20 Federal electric irons, to retail at $3.50. The companies are the Central Indiana Lighting Company, Bloomington and Columbus; Franklin Water, Light & Power Company, Franklin; and the Interstate Public Service Company in the following cities, New Castle, Lebanon, Bedford, Crown Point, Kentland, Shelbyville and Seymour.

Mr. Elder is in charge of the new-business development of 28 properties in Indiana and is being assisted by M. H. Benjamin, of the Federal System, Louisville, in covering the territory, in which the appliances he is selling had been well advertised by posters, portable signs, imprinted pamphlets, bulletins and newspaper advertising. To date the campaign has proved very successful, and a house-to-house canvass will be continued through all the properties. The Interstate Public Service Company pays a cash bonus to the representatives of its commercial department on the sale of suction cleaners.

In a recent issue of the *Employees' Magazine*, published by the Lehigh Valley Coal Company for the benefit of its thousands of employees, is an interesting article on "Electricity in Mining" by E. B. Wagner.

Utah Central-Station Company Inaugurates Appliance-Sales Campaign.

The Utah Light & Railway Company announce a change of policy in the operation of its commercial office and electric shop at 154 Main Street, Salt Lake City, Utah. The company's general offices are located at 133 South West Temple Street, which is one block from the main business street and at a rather inconvenient location for patrons. The office quarters at this location were so crowded that it was impossible to find space to introduce a display of current-consuming appliances, a thing which the company had felt the necessity of for some time. It decided to obviate these difficulties by renting an office on Main Street and fitting it up as a commercial office and electric shop, which was opened to the public in December of last year.

The company did not intend at the outset to sell electric appliances at this new shop, but simply to have them there on demonstration and to refer prospective purchasers to the various electric supply dealers in the city who handle these appliances. The careful observation of this plan of conducting a demonstration room only has convinced the officers that the results secured do not justify the expense of operating a demonstration on the somewhat elaborate scale that the company has installed. The sales force found it difficult to stimulate interest in prospective purchasers as soon as they had learned that they could not purchase the appliances from the company. The sales force could not go into a selling talk with the same spirit, knowing that they would be unable to derive the benefits of their enthusiasm by clinching a sale. It was apparent that the stock in a short time would have an obsolete and shopworn appearance, which does not obtain in a store where the stock is being turned over two or three times a year.

One of the reasons which originally led the company not to adopt a sales policy was the desire to maintain the friendliness and co-operation of the electric supply houses. It was found, however, that one or two of the houses located nearest the company's store were getting the principal benefit from it and that the balance of the dealers were not deriving any direct benefit, and that the indirect benefits were difficult to trace.

Viewed from every standpoint, the company felt in order to achieve the greatest results not only to itself, but to the entire electrical industry in the territory it served, that it should inaugurate a vigorous sales policy conducted along progressive business lines. It took the matter up with the various electric supply interests and explained that its plans were to continue to co-operate with the supply dealers, as it had done in the past, by maintaining such prices as would give a fair profit to the company and to the dealers and by purchasing the appliances through local jobbers when this could be done on equally advantageous terms. The dealers have viewed the matter broadly and have proffered their continued active co-operation and support as they have in the past.

Power Campaign at Youngstown.

The Youngstown (O.) Consolidated Gas & Electric Company is devoting considerable time and money in a campaign on behalf of the use of electricity for power, using a large amount of newspaper space regularly in the campaign. The advertising is of the argumentative and educational sort, pointing out

A World Power

Wherever Commerce goes marching on you will find the Electric Motor turning the wheels of industry, constantly, quietly and efficiently.

Electric Power Is Dependable and Economical

The reliability and lessened cost of Central Station Service makes it the universal power. It does away with worry, annoyance and breakdowns. It gives a manufacturer unlimited power at any time—you can operate one department or even one machine without running your entire steam plant to do it. Electric Power cuts costs and stops losses from friction and shafting pulleys and belts. A talk with our power engineer will cost you nothing and may profit you much. Telephone 4300.

ELECTRIC SHOP

Stambaugh Building.
YOUNGSTOWN CONSOLIDATED GAS & ELECTRIC CO.

"Do It Electrically"

Advertisement of Youngstown Company.

the numerous advantages of electricity over other forms of power. A recent piece of copy, which was unusually good, is reproduced herewith.

Commercial Men to Visit Factories in a Body.

In addition to the weekly meetings of the force in the commercial department of the Louisville, Ky., Gas & Electric Company, Robert Montgomery, manager of the department, has made arrangements for weekly visits of the members of the staff to the manufacturing establishments of the city. The first of such visits, which will be made by appointment, will be to the Kentucky Wagon Manufacturing Company's plant, will familiarize the salesmen with the workings of that isolated plant, especially as to the uses made of electricity by the company, and furnish talking points generally. The program will be continued until every manufacturing plant in the city has been covered.

Free Fan Service for the Sick.

Since it has been announced in these columns and in those of the public press, that the Louisville Gas & Electric Company, in common with all the Byllesby properties, would give free fan service to the sick poor, smaller electric companies in Kentucky have made similar announcements. One of the leaders in this work is the Kentucky Utilities Company, which operates the utilities in a number of the cities and towns of central and eastern Kentucky. On the presentation of a doctor's certificate and the statement that the patient is unable to pay for the service, fans will be provided free and temporary installations made, if needed. Lexington, Winchester Paris, Georgetown, Eminence and other towns are affected.

C. C. Barnard, manager of the Missouri Gas & Electric Service Company, of Marshall, Mo., has announced that the plan of the company put into effect last summer to provide electric fans for the needy sick without charge of any kind, will again be adopted. Where necessary, the company also will provide the current for the operation of the fans, thus removing the plan from the realm of money-making propositions.

The only stipulation is that the attending physician certify to the need of fan service and the inability of the patient to afford it. About fifty applications for free fans and service were received by the company in 1913, and it is believed that this number will be largely increased during the present year. The plan is a striking example of the new attitude of public service corporations to the public, as well as of the light in which the public now looks at such companies.

New Business Secured in Minneapolis.

Since the first of January the Minneapolis General Electric Company, Minneapolis, Minn., has secured an average of 21 contracts per week for wiring old residences, without special effort being made by the company for this class of business. The total number secured up to June 19 was 525. During the week ended June 19 the sales department closed 148 lighting contracts totaling 123 kilowatts and 14 power contracts covering 563 horsepower in motors. For the period from January 1 to June 19 the company's output shows an increase of 18.8 per cent over the corresponding period of 1913.

Electric Sign Data

Electric Signs in Brussels.

A traveler in Europe writes that of the Continental cities visited, Brussels is one of the most notable for electric signs and also for interior illumination and street lighting. Lamps of large capacity of the metal-filament type are used in interior illuminations, those of 100 watts and higher being in abundant use in hotels, stores and public buildings. Lamps of 300 watts and even larger are common in outside lighting of cafés, booths, etc.

The use of colored lamps, and of clear lamps inclosed in colored paper florettes, is common in the decorations for fetes and outside attractions. Many of these installations are temporary and changed from place to place, with the migrations of the "features."

The city is brilliant with electric signs, most of them of the flashing or changing type. The most notable, perhaps, is one on the square of the Gare du Nord, or North Station, which advertises Luna Park, with its "Attractions Americaines," an amusement feature that is found in or near most Continental cities. This sign represents a gigantic face, fashioned in red and yellow lamps, which changes its expression from a placid one to a smile and then a broad laugh. The sign is erected at a point whence the electric cars leave for the Park.

Another attractive sign is a red arrow which leads from the illuminated and changing name of a "Cinema," or a picture show, down the face of the building, its barbed point marking the entrance to the theater. The red light travels from top to point at intervals of a few seconds, and the effect is bound to be one of alurement to the show place.

Evidently the Belgians like light in large volume and are not inclined to stint themselves by the use of small lighting units.

Largest Sign in London.

The largest electric sign in London has been erected for *The London Evening News*. A feature of the sign is a monogram which indicates the exact time, changing every minute.

The sign reads: "ALL THE NEWS in THE EVENING NEWS."

Over the monogram is a line "THE TIME IS NOW." Below appears this line: "NEWS TO THE MINUTE."

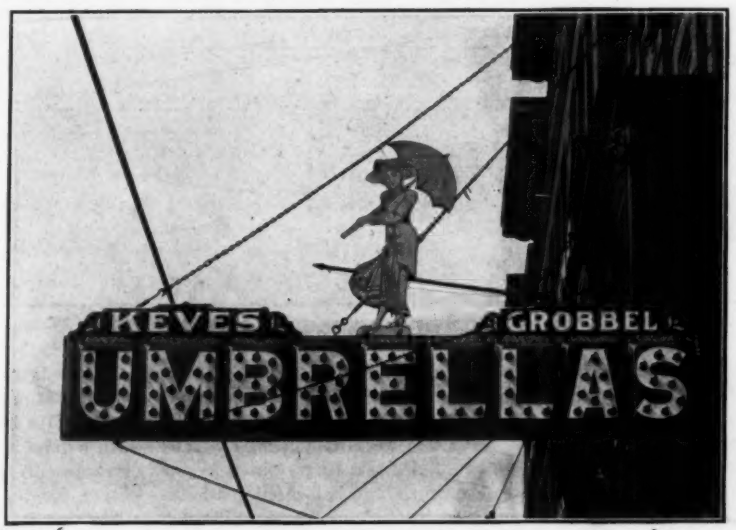
About 900 lamps are used in the sign, which has a border of green lamps. The monogram is placed in a shield of red lamps.

The section carrying the wording, "THE TIME IS NOW," drops behind the shield so that during the daytime it is not visible. When the sign is switched on this portion of the lettering becomes alight and slowly rises to its position above the shield. The special apparatus controlling this required very careful designing, the difficulty being that after the whole of the sign was switched off a period was required in which current was available to operate the motor to lower the sign behind the shield. The whole of the mechanism employed is placed on the outside of the building behind the shield.—*Signs of the Times.*

The Federal Sign System has erected a beautiful and attractive sign for the Simonds Manufacturing Company, Chicago. It portrays a buzz saw, the diameter of which is twenty feet. With its revolving motion and the throwing out of sparks it is a very unique sight to behold from the railroad which passes directly by.

A spectacular sign has been erected at Sixty-third and Halsted Streets, Chicago, for Edelweiss Beer. It contains 800 lamps, the color effect being red, green and white. The sign measures 30 by 25 feet, and can be seen for many blocks.

It has been claimed that a central station's progressiveness is indicated by the size of its electric sign load. There are cities in this country which furnish a sign load amounting to double the load due to the municipal street-lighting installation. If the sign load is not at least as great as the latter, it is evidence that the sign business has not received appropriate attention. An active campaign for sign business in the average American city can be relied upon to forward at least this proportion of business to the central-station company. The answer is up to the new-business department and the salesman.



Electric sign erected by the Federal Sign System (Electric), Chicago, Ill.

The word "Umbrellas" is made up of standard Federal 24-inch interchangeable letters, white with blue background. The entire sign is blue-enameled steel and the figure of the lady carrying umbrella is light blue and white. The sign is double-faced, there being 80 five-watt lamps to a side.

Each side flashes on alternately.

Electrical Construction

ELECTRICAL INSTALLATION IN A TANNERY.

Details of Light and Power Installation in Plant of Griess-Pfleger Tanning Company.

The plant of the Griess-Pfleger Tanning Company, near North Halsted and North Water Streets, Chicago, Ill., in which the electrical installation described in this article is installed, is a modern reinforced-concrete structure of eight stories with a three-story annex. The electrical equipment is complete and modern in all respects, a private generating plant being installed and electrical energy being used for lighting, for motor drive and for ironing.

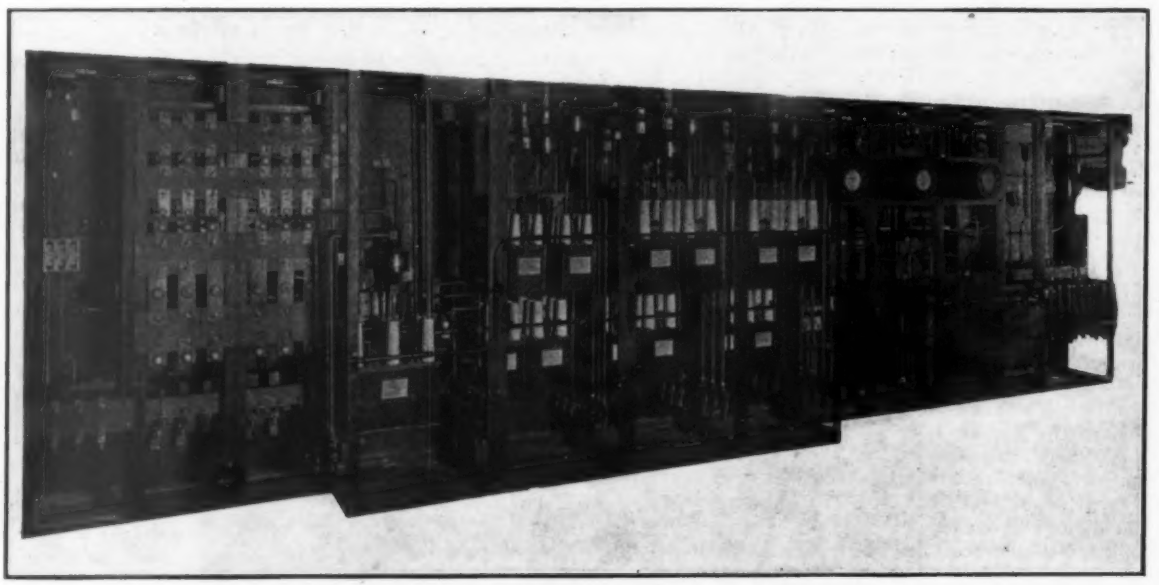
For power purposes three-phase alternating current at 440 volts, 60 cycles is employed, three-phase induction motors being used throughout the plant for the numerous motor-driven machines. For lighting purposes three-phase alternating current at 110 volts, 60 cycles is employed. In the machine shops, which are located in the annex, 110 volts, three-phase is also employed for power purposes.

Details of Power Plant.

Four 440-volt generators, each with a belt-connected exciter, are employed to deliver energy for both power and light. Two of these generators are of 500 kilowatts rating and of the Crocker-Wheeler type, each being driven by a Nordberg cross-compound engine. Of the two remaining generators, one is a 150-kilowatt Crocker-Wheeler generator direct-connected to a Ball engine, while the other is a Kerr turbine-driven 25 kilowatt Fort Wayne machine. The turbogenerator set is of sufficient capacity to carry the entire lighting load when desired. All generators are brought into synchronism when operating in parallel, by means of motors on the governors of the several engines.

Transformation from 440 volts, three-phase to 110 volts, three-phase for lighting service is accomplished by means of three 75-kilowatt single-phase Westinghouse transformers located in a basement directly below the switchboard. In this place are also located the Condit oil switches, which are electrically controlled from the switchboard. Two banks of Fletcher racks are employed to support the lead cables leading to the transformers and switches located in this basement.

In the engine room 11 550-watt tungsten lamps with Holophane reflectors are employed. A novel feature in the boiler room is the use of special construction for the steam-gauge lamps. The exposed conduit employed in the boiler room is carried down in the rear of the gauges so as to place the lamps in such positions that the dials are illuminated from the rear. For the water gauges a special type of construction for supporting the lamps is employed. The conduits leading to these lamps are equipped with swivel joints at points near the gauges, thus permitting each boiler attendant to adjust the water-gauge lamps as he desires them without having to resort to tying loops in the supporting lamp cords or tying cords to the lamp conductors to keep the lamps at desired positions.



Rear View of Switchboard.

All coal is handled by electrical methods, a motor-driven crusher, carrier, elevator and traveling crane being employed for the purpose.

The 25-foot switchboard was built and installed by Kohler Brothers, Chicago, Ill. It has 12 panels, one of which is devoted to exciter circuits, one to the voltage regular, one for each to the engine-driven generators, three for power distribution, one for the lighting transformer, two for lighting distribution and one for the turbogenerator. Weston voltmeters and ammeters are employed throughout and Condit oil switches as previously described are ::se

for circuits carrying heavy currents.

Distribution Circuits.

From the switchboard lead-covered cables are run to a large steel-door-inclosed, drained and lighted terminal rack where the transition from the lead cable system to the conduit system is effected.

All risers are carried in conduit, the conduit being exposed except in the initial run on the first floor, where it is grouted in the mortar of a pilaster built after the conduit was in place.

Separate risers are employed for power and light distribution, the various floors being fed from risers carried up the north and south walls of the building. Safety-Armorite Conduit Company's "Galvaduct" is employed throughout, and all steel cabinets and runs of conduit are painted with this company's acid-resisting paint. A separate set of power and light feeders supply the annex, feeding up and down from the second floor. Of the north and south light and power feeders, one set of each supply the second to sixth floors inclusive, while separate feeders supply the first floor and the seventh and eighth floors. The elevators and machine shop are supplied by separate feeders. The emergency lights on all floors are independent from the floor circuits and are supplied from the north and south risers.

Floor Lighting Circuits.

All floor lighting circuits are run in exposed conduit, one-half inch in diameter, the conduit being painted as before described. Condulets are employed where necessary, but in most cases all turns are made in the conduit itself. The runs of conduit are parallel or at right angles to the walls of the building, making the installation very uniform in appearance. All conduit, including that employed for the risers, was bent on the job. A two-inch plank was employed for this purpose, a hole being bored in the same of sufficient size to take the largest sized conduit employed. By inserting a length of conduit in the hole bored in the plank, the conduit could be bent to any desired angle. All lamps are individually controlled by means of lamp cords. Most of the lamps are of 60 or 100 watts rating.

The various runs of conduit were fastened to the concrete walls by means of 1.25-inch Van expanders, holes being drilled in the concrete for the purpose. These expanders give a secure support for the conduit, a thing that would be impossible if the drilled holes were plugged with wood and the conduit supported by pipe straps screwed into the wood plugs.

All light and power cabinets are of No. 10 gauge steel, painted with Safety-Armorite Conduit Company's acid-resisting paint both inside and outside. Each cabinet is provided with a vault-handle door. Owing to the concrete structure of the building, special cabinet supporting means were necessary. For this purpose one-half-inch holes were drilled in the conduit and saddle hangers supporting the cabinet inserted.

For the ironing of hides 110-volt electric irons are employed, the conduit being carried down near the tables where the iron-attachment plugs are located. In parallel with each iron circuit is a pilot lamp designed to show whether or not the current is turned on for the iron.

In the machine shop provision is made for the attaching of temporary lamps, runs of conduit being carried down along the side of columns and terminating in three-way receptacles located several feet above the floor.

Power Wiring.

Both individual and shaft drive are employed in the plant, the type of drive used depending upon the nature of the operations to be performed. All power wiring is carried in exposed conduit painted and hung as described in connection with the lighting circuits. Owing to the numerous motors employed throughout the plant and the large size of many of them, the three-phase power riser system employs six feeders grouped three in a pipe, care, of course, being taken to have all three phases present in each conduit. All six feeders are carried to the cabinets where they are combined by fastening them to the three-phase buses. Many of the motors are installed on the ceiling, in which case care is taken to provide secure supports, particularly in the case of motors of large size. These supports consist of 10-by-4-inch timbers bolted between beams, 10-by-3-inch timbers being bolted to the heavier timbers and serving as supports for the sliding bases of the motors.

The controllers for the various motors are all situated on columns or walls near the motors controlled, the conduit being carried down exposed to the controllers. Detroit Fuse & Manufacturing Company's starters are employed for motors up to five horsepower, the starters being fool proof. For motors of larger capacity Allis-Chalmers' potential starters are employed.

In addition to the equipment thus far mentioned, an electric sprinkler alarm system is installed.

The entire equipment was designed by C. G. Atkins, consulting engineer, Chicago, Ill. Freeman Sweet & Company, of the same city, had the contract for the installation work, excepting the switchboard, which was installed and built by Kohler Brothers, Chicago, Ill.

Cautions for the Electrician.

Consider all circuits as dangerous.

Consider all circuits as being "alive" at all times, and do no work on a circuit until you have satisfied yourself that it is dead.

All circuits must be regarded as "grounded."

Do not wear finger rings, as they are liable to cause short-circuits and arcs.

Never leave a switch closed when not in use.

Never close a switch in a hesitating manner.

Form the habit of operating switches with one hand and never attempt to operate more than one switch at a time.

Be sure that switches are wide open when in the open position, and fully closed when in the closed position.

Do not open a field circuit until all the resistance in the field rheostat has been cut in, and then open the circuit slowly to avoid inductive effects.

Do not open air-break switches carrying heavy loads, but open the circuit-breakers or field switches.

Do not stand over circuit-breakers, as if one opens the arc is capable of causing serious burns.

Never stand on belts or go through them even when stationary.

In starting a motor inspect the bearings for oil, and in case of a shunt motor be sure that all field resistance is cut out. Never start a series motor without load.

Do not remove the brushes from the brush holders of a machine the field of which is excited.

Learn the details of the "prone pressure" method for resuscitation from electric shock.

Kentucky Contractors Organize.

When the National Electrical Contractors' Association meets next week in Detroit an official representative will be present for the first time from the Kentucky branch of that organization. The Kentucky branch, made up of members of the national organization in Louisville, Paducah and Frankfort, organized only last week and chose F. E. Good, of F. A. Clegg & Company, of Louisville, as the state representative.

Gus Albrecht, Jr., of Albrecht Sons, Louisville, is president of the Kentucky branch; S. D. Dalby, head of the electrical concern of the same name in Paducah, is vice-president; F. F. Valinoti, of the Harry I. Wood Electric Company, Louisville, is secretary-treasurer, and M. R. McKinney, of the McKinney Electric Company, Frankfort, is sergeant-at-arms.

Fourteen of the members of the Kentucky branch will be inattendance at the Detroit convention. This will include all the members of the Louisville Electrical Contractors Association who are members of the National Association.

ELECTRICAL INSTALLATION IN PLANT OF THE LINCOLN ICE COMPANY.

Details of the Switchboard and Wiring for Light and Power.

Ice making by the raw-water process is coming into extensive use and has opened up a desirable field for the utilization of electrical energy. To the ice manufacturer this process appeals in a very strong manner, as it removes the necessity of locating plants in such locations that permit of ready and convenient supplies of coal. By using the raw-water process an ice plant may be situated in thickly populated sections of a city, near or in the heart of the distribution district for the product, thus eliminating the necessity for a great amount of cartage.

The raw-water process requires no steam and hence no coal, for electric power may be used throughout. The process consists of forcing air into the center of the ice tanks during the freezing process. All impurities pass to the center of the tank and when the main portion of the ice is frozen, the impure water in the center of the cake is pumped out, the hole refilled and the process continued.

The plant of the Lincoln Ice Company is a typical raw-water plant, making 200 tons of ice per day. It has one story, the atmospheric condensers and cooling towers being located on the roof.

Power is obtained from the 4,400-volt 60-cycle line of the Commonwealth Edison Company and transformed to 220 volts by means of six single-phase Pittsburg transformers, two transformers being designed to operate in parallel across each of the three phases. These transformers are of the outdoor type and are installed on a pole structure reaching a few feet above the roof level, the poles being near enough to the building to permit access to the transformers from the roof. Fig. 1 shows the location and arrangement employed. On the poles are also located the wooden cabinets containing the emergency cutout switches, etc. Fastened to the center pole are two conduits, through which the service cables from the low-tension sides of the transformers are carried underground to the power plant in which is situated the main switchboard.

Switchboard Details.

The switchboard is of two-inch black slate and contains four panels. It rests on a five-inch channel iron and is supported on a two-inch angle-iron frame which also supports a narrow fuse panel running the length of the board and situated a sufficient distance in the rear of the board to permit of ready access to all parts of the board. Figs. 4 and 5 show a front and rear view of the board. It was installed and built by Henry Newgard & Company, Chicago, Ill.

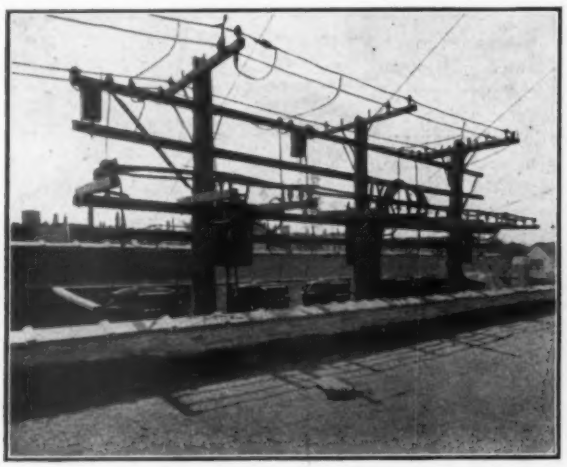


Fig. 1.—Service Transformers.

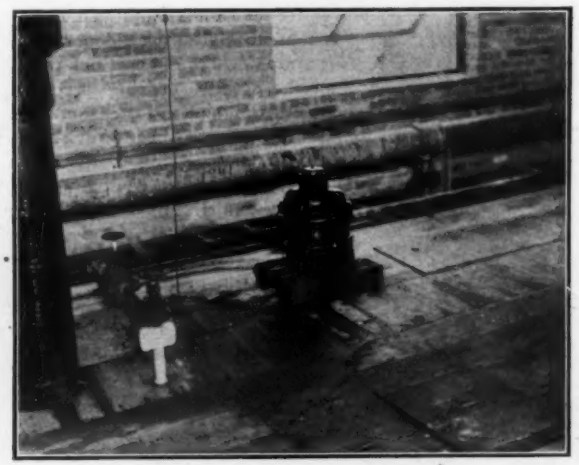


Fig. 2.—Brine-Agitator Motor.

The right panel or panel No. 1 is the service panel and contains a 2,000-ampere, three-pole Trumbull service switch, a General Electric watthour meter, a Minerallac Electric Company's contact-making clock and printometer, and a Weston polyphase wattmeter. The printometer and contact-making clock records at regular intervals the power being consumed.

The next two panels are similar, one of them controlling a 300-horsepower three-phase induction motor and the other controlling a 150-horsepower three-phase induction motor. Both of the motors are belted to ammonia compressors. Each of these panels contains a three-pole Condit carbon circuit-breaker with overload trip coils and a low-voltage trip mechanism, three low-current coils and a Weston polyphase wattmeter. The service buses are carried near the top of the board, as shown in Fig. 3, and a set of distribution buses near the bottom. To the lower buses are connected the various minor power feeders. Link fuses mounted on a piece of slate to the rear of the board are used except where otherwise indicated on the diagram of connections.

The use of the low-current coils is a new feature which is worth noting. The old method of protecting a motor against low voltage has been to have one low-voltage coil connected to one phase so that in case the line voltage falls, the circuit-breaker controlling the motor will trip. This protection, however, does not provide for protection in case the voltage should fall on either of the two phases not connected to the low-voltage coil. Failure of voltage on one of these phases would hence cause a three-phase three-wire motor to run single phase. The method employed on this board prevents such a condition, as a low-current coil is inserted in each phase.

Each of these low-current coils takes the full current of one phase, as seen in Fig. 3. Whenever the motor is in operation the current passing through each of these three coils will cause their iron cores to become magnetized, thus causing them to attract discs, each of which short-circuits two terminals. These terminals are all connected in series with the low-voltage coil, which is connected into one phase on the load side of the circuit breaker. It is now obvious that if the current should drop in any phase, the contact-making disc for that phase will drop and thus open the circuit connected to the low-voltage mechanism, which in turn will trip the circuit-breaker.

In parallel with the trip coil of the circuit-breaker is a circuit controlling the compressor suction valve. This circuit is connected in series with the contact points of a governor switch. Hence when any phase of the feeding circuit fails, the coil of the cut-off trip drops its armature and closes the suction line to the ice machine, thus taking the greater part of the load off the compressor and motor.

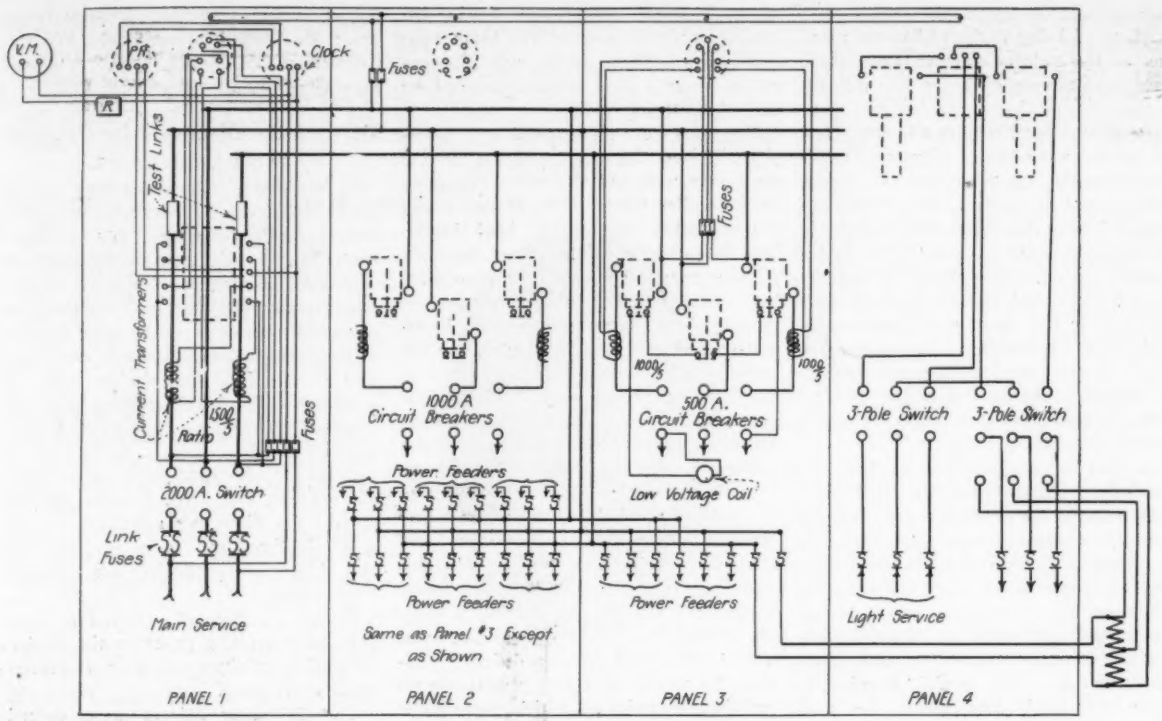


Fig. 3.—Switchboard Diagram.

At the same time a signal-bell circuit is closed, calling the attention of the operator to the fact that the suction line has been closed. This valve is so arranged that it must be operated manually after the plant has resumed operation.

If the speed of the motor is reduced from any cause, a governor switch on the compressor opens the trip-coil circuit, thus taking the load off the compressor by closing the suction-line valve and operating the signal bell.

The low-current coils are provided with an oil-dash-pot time-limiting device with regulating means.

These devices have found extensive use in ice-plants of Chicago. Nels Joleen, of the Commonwealth Edison Company, Chicago, is the inventor.

The fourth panel is intended for lighting service. Under ordinary conditions the power for lighting service is taken from one phase of the 220-volt three-phase system through an autotransformer which transforms to 110-220-volt three-wire service, thus furnishing the required 110-volts for lighting. This power is obtained from the adjacent power panel as indicated and is hence recorded by the watthour meter on panel No. 1. However, to provide for emergency, a three-pole single-throw service switch connecting with Commonwealth Edison three-wire lighting feeders, is installed on this panel. In case this service is used, the power is recorded by a three-wire watthour meter and two maximum-demand meters shown at the top of the lighting panel. Link fuses mounted as before mentioned for power fuses are employed.

Light and Power Circuits.

The large induction motors driving the ammonia compressors are controlled by means of drum controllers, the necessary resistance units being mounted in

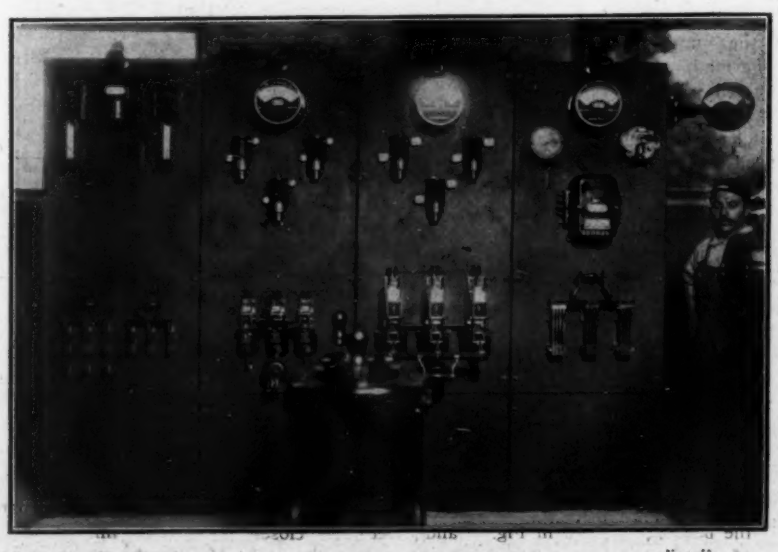


Fig. 4.—Front View of Switchboard.

Fig. 5.—Side View.

back of and on top of the switchboard. In place of being designed for the usual one or two-minute starting duty, these resistances are designed for five minutes starting duty, owing to the fact that compressors in general require a longer starting period than two minutes. Lead-covered cables are employed to connect these motors to the board and control apparatus, the cables being run in ducts in the concrete floor of the room. Lead-covered wire is also employed for the light feeders and other power feeders employed in this room which is naturally subject to the presence of ammonia gas. These circuits are run in conduit which is concealed except for a few vertical runs carried up steel columns to supply motors and lights.

In this room are also located two squirrel-cage three-phase General Electric induction motors driving pumps for circulating condensing water, and two similar motors driving the blowers which supply air under pressure for agitating the water in the ice cans. These motors are controlled by means of General Electric autostarters mounted on convenient steel columns. The conduit running to these starters is run along the steel columns and ends at steel boxes mounted above the starters and containing the necessary fuses. The conduit for column lights is run in a similar manner.

In the ice-making room exposed conduit work is employed throughout, the conduit runs being so arranged as to be well drained, as condensation cannot be avoided in such rooms. In this room are situated six brine agitators for the three 60-ton ice-making tanks, three one-ton electric cranes and two two-horsepower three-phase induction motors driving piston pumps which are used to withdraw core water from the tanks.

The motors employed for agitating the brine are of the vertical-shaft 220-volt three-horsepower type and are mounted on the framework of the ice-tank room as shown in Fig. 2. All of these motors are arranged along the side of the room and are supplied by runs of conduit carried on the nearby wall at a distance of about two feet from the floor, the distance from the floor decreasing slightly along the length of the room. A right-angle fitting and a short run of horizontal conduit at right angles to the wall are employed for supplying the various motors. The short horizontal runs are bent so as to enter the conduit openings provided in the base of the motors. The runs of conduit on the brick side wall are supported by pipe straps, or where several runs are close together they are supported by means of strap iron bent and fastened to hold all the runs.

The lamps in this room are fastened to the wood beams, the lamp boxes being fastened to the beams in an offset manner so as to allow the runs of conduit carried along the sides of the beams to be run to the outlet boxes without necessitating the cutting away of part of the beam near the boxes. These lamps are all controlled from a steel cabinet mounted on one of the brick walls.

The cranes are all supplied with three-phase power, the conduits being carried up a side wall and the wires connected to the trolley wires of the cranes, which are supported by porcelain knob insulators mounted on painted wood supports.

The two two-horsepower motors driving the core-water piston pumps are mounted in the same manner as the brine-agitating motors, but the conduit work is slightly different and the motors are of the horizontal-shaft type. The conduits are carried down to the framework of the ice-tanks and the wires are led to the motors through porcelain conduit fittings.

In the ice-storage room exposed wiring is employed for lighting, thus eliminating conduits in which condensation will always occur in such a room. In this room are also located two five-horsepower induction motors driving a chain ice conveyor. These motors are controlled from the outside delivery platform by means of Sundh remote-control push-button switches which permit the man loading wagons to have the rapidity of supply of ice under his control. The man in the storage room only has to keep blocks of ice upon the chain ready for removal.

Stephen Hobert, Chicago, Ill., was the consulting engineer. Henry Newgard & Company built and installed the switchboard, while Conrad Grunhow was the electrical contractor.

Automatic Light Control for Fire-Engine House.

Installations of an automatic light control system in Engine House No. 15, of the Louisville, Ky., Fire Department has just been completed by the Harry I. Wood Company. This is one of the numerous similar installations to be made at all of the houses of the Louisville department, the changes being made gradually. The automatic switches, controlled by a "joker" released when the alarm is sounded, light two clusters in front of the engine house, five inside the house and one in the men's dormitory. The lights burn for a short time and then are automatically extinguished. A three-way switch provides for constant illumination when desired.

Philadelphia Contractors Elect Officers.

At the annual meeting of the Philadelphia Electrical Contractors' Association at the Colonnade Hotel, Philadelphia, Pa., many important matters were discussed and a good luncheon enjoyed. F. M. Shepard was elected president; H. G. Kepler, vice-president; H. Eckstein, treasurer; M. G. Sellers, secretary; W. McCandless, E. R. Keller, R. C. Williams, executive-committee members.

Direct Bids Discussed by Pennsylvania Contractors.

At the recent annual meeting of the Electrical Contractors' Association of the State of Pennsylvania, the secretary-treasurer, who also acts as the secretary to a joint conference committee of several trades interested in securing the proper enforcement of the state law requiring separate specifications and direct bids for electrical and similar work, reported that the law was being generally observed throughout the state to the advantage of all.

Frank H. Stewart gave an excellent address on "The Past, Present and Future of the Electrical Industry."

H. C. Spaulding spoke on the aims and objects of the Society for Electrical Development.

George E. Shepard, of Wilkes-Barre, gave an interesting paper on the need of state-wide activity upon the part of electrical contractors.

The following officers were elected: F. M. Shepherd, Philadelphia, president; J. S. Musser, Harrisburg, vice-president; M. G. Sellers, Philadelphia, secretary-treasurer; M. E. Arnold, G. E. Shepard, directors; G. E. Shepard, national director.

Graphite.

Graphite or plumbago, next to diamond the most refractory of all varieties of carbon, is a mineral of great and increasing industrial importance. The Island of Ceylon, off the coast of India, is the world's greatest graphite-producing center and the United States absorbs about one-half of its product. The domestic production of natural graphite in 1913 was only 4,775 tons, valued at $293,756. It has been fully demonstrated that natural graphite occurs in our own country in practically inexhaustible quantities, as small flakes in banded rocks known as chists. The graphite forms only 5 to 10 per cent by weight of the rock, and the crushing of the rock and clean separation of the graphite flakes have proved commercially successful only in a few favored places. A number of new methods are now being tried which it is hoped will prove more efficient—notably the electrostatic process that has been applied with so much success to the treatment of zinc ores.

Hixon Becomes Director.

Alfred J. Hixon, of Boston, was recently elected a national director by the Massachusetts Electrical Contractors' Association. J. P. Coghlin, of Worcester, was elected alternate.

THE NEW HOME OF THE FREEMAN-SWEET COMPANY.

A Description of the Offices and Store, and Ernest Freeman's Ideas on the Retail Supply Business.

The Freeman-Sweet Company, of which Ernest Freeman, the president of the National Electrical Contractors' Association, is a member, recently removed its offices from the Morton Building to a large suite on the second floor of the Transportation Building, 608 South Dearborn Street, Chicago, Ill.

The Offices.

The offices are spacious, well lighted and well arranged. One of the illustrations shows a general view obtained upon entering the offices. In the space shown in the foreground stenographic and clerical help are located, while the offices of the members of the firm and their assistants are located on the two sides of this space. Mr. Freeman's office is located to the left and is shown in one of the illustrations. It is tastily furnished throughout, as can be seen from the view on the next page.

Store and Stock Room.

On the ground floor of the building, the firm has a space extending from the front to the rear of the building. This space is divided into two parts by a wall, the space in front serving as a retail supply store and that in the rear as a stock room.

The store is finished in mahogany and marble and has two large and well arranged show windows in which are exhibited from time to time various types of household heating and cooking devices, fans, batteries, wiring supplies, etc. As the show windows have no backing, persons passing by are given a full view of the interior of the store, thus being able to see the washing machines, vacuum cleaners and numerous other devices not in the show windows.

All heating and cooking devices within the store are kept in glass show cases, thus protecting them from the effects of the air and keeping them free from dust. From the interior view of the store it can be seen that one

Ernest Freeman.

of the glass cases serves as a counter and contains mainly heating and cooking devices. To the rear of this combined counter and show case is a wall case with glass doors. In this case heating and cooking devices are also kept. A table is provided for displaying electric fans, while vacuum cleaners and washers are exhibited at convenient places in the store. Baseboard outlets are provided to permit the demonstration of machines and devices.

The firm does not handle one particular make of heating and cooking devices, fans, vacuum cleaners or washers, but, on the contrary, handles several makes of each.

The left side of the store is equipped with a mahogany counter to the rear of which are mounted open shelving and drawers. The shelves and drawers contain miscellaneous wiring supplies, batteries, etc., pains being taken to retain them in neat order at all times.

The door to the rear of the store leads to a stock room in which the firm keeps the stock required for its electrical-contracting business and such stock as is necessary to have on hand in connection with the retail supply business. This room contains shelving around the walls and in rows in the room space thereby permitting everything to have its place. In this room, of course, are located the desk and files of the stock room.

One prominent feature in connection with the store and stock room is their neatness. The commanding view of the entire store obtained by a passerby serves as an attraction while the neatness of the store emphasizes the cleanliness and attractiveness of electrical devices for the office and home. In fact, the entire new home, including store, offices, and stock room, is one in which the firm and electrical contractors in general may well take pride.

Ernest Freeman's Views.

When asked for his reasons for entering the retail supply business and the advisability in general of electrical contractors entering this business, Mr. Freeman stated that he considered the retail supply business an excellent one for electrical contractors to enter. In seeking new offices, the firm aimed to secure offices in a building which would permit of maintaining a ground-floor stock room. As a result the firm secured its present quarters, which, however, are slightly outside of the main retail district of Chicago. Finding, however, that its new quarters permitted of entering the retail supply business, it was deemed advisable to enter this business as it was thought that even in this locality a store would be

Interior View of Store.

Exterior View of Store.

General View of Offices.

Ernest Freeman's Private Office.

desirable for several important reasons.

In addition to the profits obtained from the sale of electrical devices Mr. Freeman stated that it was thought that many persons passing by and desiring electrical work to be done would notice the window signs and displays and thus give the firm the work. Although the store has only been opened for several weeks, many persons have given the firm contracts as a result of having seen the store, thus fulfilling the firm's expectations.

Mr. Freeman thinks that all contractors will find a retail supply store not only a source of retail business and profit from the same, but also a means of obtaining work which would otherwise pass to another contractor.

New York Contractors Have Outing.

The Independent Electrical Contractors' Association of Greater New York, recently had an outing at Morningside Park Hotel, Jamaica, L. I. A souvenir program of merit displaying the advertisements of many jobbers and manufacturers was published for the outing. L. H. Wood is the president of the association.

Contractors Have Electricians as Guests.

Members of local No. 7 of the International Brotherhood of Electrical Workers, of Springfield, Mass., were recently the guests of the electrical contractors' association of that city at a dinner given at the Highland Hotel. This dinner was arranged to bring the contractors into friendly relations with the workmen. The meeting was addressed by G. H. Wrenn, president of the Central Labor Union, who spoke on the subject of cooperation between contractors and workmen. Building Commissioner F. W. Lumis spoke on the subject of efficiency. J. J. Collins and K. Sternburg spoke.

Among the Contractors.

The Sackett Mine Supply Company, of North Third Street, Columbus, O., is the successful bidder on the electrical work for the new White-Haines Building, a six-story reinforced-concrete structure now under way in that city. The contract amounts to about $4,000, with considerable extra work in prospect, and includes everything electrical outside of the elevators.

The Browe Company, Newark, N. J., has been awarded the contract for the installation of lighting fixtures in the new nurses' home at the City Hospital, of Newark.

A new woman's dormitory for the Institution for Feeble-Minded Youth, at Columbus, O., calls for some $2,000 worth of electrical work in the way of wiring and installing vacuum cleaners, which is to be handled by the McKeever Electric Company, of Columbus.

George D. Beinert, West New York, N. J., has been awarded a contract for electrical work at the new factory now being erected by the Catoir Silk Company.

M. R. Johnson, formerly with the Caldwell Electric Company, of Champaign, Ill., has gone into business for himself and has opened an electrical shop at 84 North Neil Street in Champaign.

An interesting contract just let to the Harry I. Wood Company, of Louisville, Ky., is for wiring the motion-picture theater being constructed in Louisville for M. Switow, who is at the head of the Fourth Avenue Amusement Company. Wiring will be for light and power, for both alternating and direct current and will involve about $1,800, exclusive of the fixtures.

Contracts to install a lighting and heating plant have been let by the Board of Trustees of Transylvania University, at Lexington, Ky., to Frank Corbin. Work is under way.

The contract for wiring the addition to the grammar school in Madison, Ind., has been given to D. James Gerber.

The contract for the installation of electric fixtures and wiring in the Lincoln Park High School of Tacoma, Wash., has been awarded to William A. Mullin Electric Company, of Tacoma.

The Ewart Electric Company, of Astoria, Ore., has been awarded a contract by the County Court for installing electric wiring and fixtures in the new county court house.

R. C. Bierdemann Company, Chicago, Ill., will install 100 lamps and four motors, totalling 100 horsepower, in the construction plant of the Thomas Elevator Operating Company, 101 North Wabash Avenue, Chicago.

C. F. Kunz Company, Chicago, Ill., will wire the church now being built at 653 North Carpenter Street.

C. G. Rush Company, Chicago, Ill., will install seven motors aggregating 200 horsepower in the plant of the Cragin Elevator Company, 1885 North Laramie Avenue, Chicago.

Henry Newgard & Company, Chicago, Ill., has the contract for installing and wiring 160 lamps and two motors in the Messinger Lunch Room, 72 West Madison Street, Chicago. This company is also installing a number of lamps and 10 motors aggregating 202 horsepower in the plant of the Crawoig Ice Company, Chicago.

The South Side Electric Company is installing several arc lamps and seven motors totalling 135 horsepower for the Wednagel Company, 600 West Twenty-second Street, Chicago.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

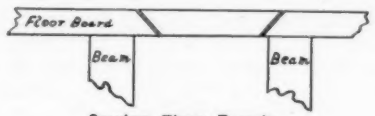
Making Double-Arming Bolts.

We are building several miles of new transmission line, and were threatened with a hold-up on operations a few days ago on account of a shipment of double-arming or space bolts being lost. It meant stop work or else cut and fit blocks to go between the arms on poles needing double arms, and numerous curves meant many of these. We got out a lot of iron rod and started to cut long threads to make the double-ended bolts, when after cutting half a thread I looked around to see what our small lathe could do for me. I put the piece of rod into the face plate, put the lathe on low gear and then threw in the reducing-gear, which makes the lathe turn several times slower than usually used. I started the lathe and let the handle of the die-stock rest on the lathe bed and travel along on that as the thread was cut. It turned at a slower motion than a man would make in turning the stock by hand, but it was going all the time and hence greater progress was made. All I had to do was to feed lard oil to the die. When six or seven inches of thread was cut, I threw out the reducing gear and reversed the lathe motion, moving the die off the work in a comparatively very rapid manner. It took but a moment to reverse the rod in the face plate of the lathe and start cutting the thread on the other end, and a double-arming bolt was finished. It took but a few hours to cut a large number of these bolts, and to have done this by hand would have meant much time and hard work.

C. W. Goddard.

Locating Short-Circuits.

I have had trouble several times with concealed wiring due to short circuits under the floor, and in order to locate the short-circuit without removing the floor boards, I use a coil of about 150 to 200 turns of No. 30 cotton-covered wire, the ends of which are connected by a long flexible cord to a watch-case telephone receiver which should preferably be equipped with a head band. Three or four batteries in series with a buzzer, or a source of alternating current in series with an incandescent lamp, should be connected to the circuit to be tested. Placing the telephone receiver to the ear and passing the coil over the floor, one can easily locate the circuit as a buzzing sound will be heard in the telephone receiver when the coil is over or near the circuit. Tracing the circuit in this manner, the short-circuit will be indicated by a sudden cessation of the buzzing sound, a gradual cessation of this sound being an indication that one is departing from the line of the circuit under test. As this device depends on



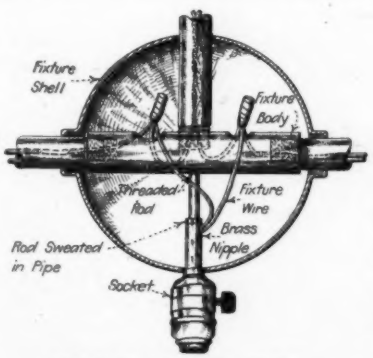
Sawing Floor Boards.

electromagnetic induction for its action, the coil should be mounted on an iron core.

J. S. Dodds.

Removing Floor Boards.

In most cases where a short length of a floor board has to be removed, the board is cut vertically with the result that when the board is replaced it is difficult to support and does not fit snugly. I, therefore, make such cuts at an angle of 45 degrees to the vertical as shown in the sketch. When the board is replaced it is self supported at the proper height and the cut is hardly visible.



Additional Lamp on Fixture.

William A. Murray.

Additional Lamp on Fixture.

I had occasion to install a lamp at the body of a ceiling fixture and used the method shown in the figure. The shell of the fixture body was reamed to take a one-eighth-inch brass nipple as shown. This nipple was fastened to the fixture body by a threaded rod sweated in a one-eighth-inch pipe. In this way a firm support was secured for the lamp socket. The fixture wires were tapped and connected as shown.

J. B. Story.

Plugging Conduit.

When installing conduit in concrete portions of a building I find it necessary in most cases to cap or plug the ends of conduit risers in order to prevent concrete and other matter entering the conduit. Cotton waste and wooden plugs are unsatisfactory as they are easily knocked out. I therefore make use of the knockout segments of outlet boxes, placing them in end bushings which are then screwed on the ends of the conduit. Half-inch knockouts inserted in three-fourth-inch bushings should be used with three-fourth-inch conduit, and three-fourth-inch knockouts inserted in one-inch bushings should be used with one-inch conduit. As both knockouts and bushings are always available when making a conduit installation, this scheme is very convenient.

L. W. Smith.

Fishing in Partitions.

In the issue of March 14 there is a wiring kink by A. H. Jackson on "Fishing in Partitions." He recommends the use of a chain such as plumbers supply for bath-tub drains, but I find that a five or six-foot length of socket chain attached to a small linen line is much better for the purpose and that it will carry a line through a partition where the other method fails, owing to the fact that the plumber's chain hangs more easily on plaster or nails. In short runs of not more than ten feet I use the chain without the linen line.

Bert Wicker.

Closing Cotter Pins.

To close a cotter pin, the average person will try to bring the legs of the pin together by bending with a pair of pliers, either putting a knife blade or some similar article near the head of pin, or bending first one way and then the other. The quickest and a more mechanical way of closing a pin is to first take any sharp bends out of the legs of the pin. Then stand the pin on end. Assuming that both legs are even, rest one end on a convenient object and tap the head of the pin, thus making one leg shorter than the other. Then reverse the legs and hit the longer leg, thus causing both legs to be brought solidly together along the entire length of pin. If one leg of the pin is already shorter than the other, only the longer leg need be tapped. This idea will be found particularly good when installing oil switches of either the hand or solenoid-operated type, as in many cases a great number of pins are used and the holes for the pins are not often very accessible. In such cases a straight pin will save much trouble and annoyance.

H. W. Parsons.

Public Service Commissions

Conducted by William J. Norton

ILLINOIS.

The Farmers' Mutual Telephone Company of Ransom was ordered to discontinue granting a special rate for service to stockholders. The Commission finds: "That the practice of exempting stockholders who own their own telephones from any fixed rate or charge, and of substituting for such rate an assessment to meet expenses of operation and maintenance, is an illegal practice, and must be discontinued; that under the conference ruling, and other decisions heretofore made by this Commission, stockholders cannot be given any greater or less or different rate than the rate imposed upon other subscribers, but must be left to the income derived from the stock for any profit which may be received; that this difficulty is not met by the substitution of an assessment, of a fixed amount, against stockholders."

The company is ordered to charge stockholders the regular rates for the service rendered.

The Illinois Telephone Company was authorized to make certain changes in rates that were in effect July 1, 1913 in its exchanges at Bluffs, Carrollton, Greenfield, Roodhouse and White Hall for the purpose of eliminating concessions and preventing discrimination.

The National Telephone & Electric Company. The order of the Commission authorizing the National Telephone Company of Clinton to charge 80 subscribers, who own their own instruments, the same rate charged other patrons of the company was appealed to the Sangamon County Circuit Court. The appeal was taken on behalf of the subscribers and it is urged that these subscribers have valid contracts with the company at the lower rate, warranted by the ownership of the instruments.

INDIANA.

Franchise Rates. The attorney-general has rendered an opinion for the Commission in regard to the Commission's power to increase rates above the maximum charges fixed by franchise. The attorney-general holds that it was within the power of the Legislature to have conferred authority upon the Commission to increase such franchise rates, upon surrender of the franchise by the utility for an indeterminate permit, but that no such power was conferred upon the Commission. "Section 7 of the Public Service Commission Act (Acts 1913, page 171), contains this proviso: 'Nothing in this act contained shall authorize any public utility during the remainder of the term of any grant or franchise under which it may be acting at the time this act takes effect to charge for any service in such grant or franchise contract, exceeding the maximum rate or rates therefor, if any, that may be fixed in such grant or franchise.' I think this language can receive but one construction with reference to the question you propound. It limits the power of the Public Service Commission with reference to fixing the rates for any utility service during the term of any contract it had with the city at the time the act went into effect; that is to say, it limits the power of the Commission in respect to increasing or raising the rate to the maximum rate fixed in the contract.

"If in any case conditions are such that reason or justice require a rate should be raised above the limit named, I think the only safe thing would be to have the Legislature change the statutory provision quoted so as to remove the limit on the power of the Commission."

In answer to the question as to whether the city has a contractual right which cannot be taken away during the life of such a franchise the attorney-general further states that "by proper steps the State, with the consent and co-operation of the utility, may modify or change the contract mentioned as against the city, and thereby take away its contractual rights thereunder. The city in entering into the contract in the first place acts only through its officers. Under the act of 1905, these officers in some instances were the City Council, in other instances the Board of Public Works and the City Council. In the absence of any legislation limiting or restraining the action of these city officers, they at any time after the contract was entered into could modify the same by entering into a new contract with the utility; that is to say, such officers could so do and bind the city so long as the power remained with them. The State could take the power from those officers at any time it saw fit through its legislative department and vest it in other officers. By the Public Service Commission Act of 1913 it has taken from city officers certain powers which they theretofore exercised, and conferred those powers on the Public Service Commission, which Commission as to the powers so conferred now stands in the shoes, as it were, of the City Council with reference to them. The Commission is the representative of the State and of each city within it to the extent that power has been conferred upon the Commission.

"As you are well aware the power to regulate rates for public service always existed in the State through its legislative department. Whatever power in that respect was exercised, either by legislation or contract by said officers, was a power conferred upon them by the State. The State could withdraw this power from them and confer it upon the Public Service Commission, as it has attempted to do by the act of 1913, where the contracting utility consents and co-operates by surrendering its franchise."

MASSACHUSETTS.

The Cambridge Electric Light Company. The Board of Gas and Electric Light Commissioners has rendered a decision fixing rates to be charged for street lighting in the city of Cambridge.

MISSOURI.

Court Decision. The Supreme Court of Missouri, on July 2, handed down an opinion, holding that the Public Service Commission has the power and authority to determine just and reasonable rates for intrastate railroads and its action is not limited by the maximum rates prescribed by the Legislature in the maximum passenger and freight rate laws of the State. The opinion states that the Public Service Commission Law, subject to constitutional provisions, occupies the entire field on the given phases relating to rates and service, and that statutes enacted prior to this law, prescribing hard and fast lines above which rates could not be raised must give way, being inconsistent and in conflict with the Public Service Commission Law in

cases where the facts warrant a higher rate. The statutory maximum rates, therefore, are in force until facts established before the Commission call into play the modifications contemplated by the utilities act.

This is the first opinion handed down by any court directly passing upon the power of public service commissions to authorize rates in excess of maximum rates prescribed by statute. The question has been discussed *obiter* by the New York and Washington courts, but not in a proceeding wherein the direct point involved was the power of the commission to raise rates above the maximum prescribed by statute.

Springfield Gas and Electric Company. The opinion rendered June 23, 1914, sets forth the corporate and financial history of the predecessors of the Springfield Gas and Electric Company, beginning with the organization of the Springfield Gas Lighting Company in 1875, and following the various consolidations with other companies up to the organization of the Springfield Traction Company and the Springfield Gas and Electric Company, defendants in this case. All the stock of these companies is owned by the Springfield Railway and Light Company, a holding company of Maine, and all of the latter company's stock is in turn owned by the Federal Light and Traction Company, a holding company of New York. In February, 1913, an agreement was made between the Springfield Railway and Light Company, the Maine holding corporation, and the Springfield Gas and Electric Company and Springfield Traction Company, transferring the steam power plant to the Gas and Electric Company for $388,416. This consideration was paid by certain entries on the books of the companies. Later the valuation of the steam plant was increased and a further book entry was made against the Springfield Gas and Electric Company, making the total consideration $414,526 and thus supplying a conveniently large basis for the calculation of light rates. The Commission holds that this attempted transfer was a palpable attempt to transfer a useless power plant from the unprofitable Traction Company and unload it upon the prosperous Gas and Electric Company and thus have its value amortized out of the earnings of the more prosperous company. And the Commission holds that the attempted transfer and sale while the rate matter was pending was a fraud upon the public and therefore void. In the subsequent consideration of the case this power plant is treated as the property of the Traction Company.

In considering the salaries and commissions paid the Federal Company the opinion states: "We think because of this situation (control by Federal Company through Railway Company of Maine) and the very human tendency of corporate greed of some holding companies to 'milk' the earnings of its subsidiary companies through 'dummy' directors, that it is the duty of this Commission to strictly limit the amount of any such charges which shall be only for the services rendered by such holding company to the lowest reasonable charge for the services actually rendered. * * * The public at Springfield is paying the salaries of a competent manager and a competent secretary of defendant companies who reside at Springfield, and we do not think that the public should be called upon to pay any other 'managerial services' or management by 'long distance' from the New York office of the holding company in this case. No charge should be allowed for commissions, except for services actually rendered to the company, and that at no higher cost than the local company could employ the services of a competent independent engineer, provided that the manager in charge is not able and competent to render such service to the company himself. * * * We disallow any charge whatever for 'managerial services.'" Open, fair, arm's length dealings, one with the other, is stated to be better in the end for interrelated corporations. The deduction of salaries and commissions takes $18,000 annually from operating expenses.

Evidence was introduced at the hearing to the effect that an up-to-date distributing system could be built at Springfield for the cost of $151,266. It was noted also that the assessed value of the entire property of the Gas and Electric Company for 1911, was $150,000, inclusive of the gas department. It was found that stock to the amount of $500,000 and bonus to the amount of $277,000 were issued on property for which the secretary of the company testified $300,000 was paid. The assets of the Gas and Electric Company as shown by the books are $865,718.89 for the electric department. It was observed that no deductions for superseded property had ever been made by the company, and that except for an item of $5,666.13, no depreciation had been deducted during 20 years; and further that $60,000 is included as franchise values of the gas and electric property. The Commission arrives at the conclusion that $270,000 is the corrected original cost of the electric department of the company, holding the amount for which the plant was transferred upon the books of the company, $414,526, to be entirely too large.

In view of the fact that the Springfield Gas & Electric Company and the Springfield Traction Company have a contract with the Ozark Power & Water Company, calling for the furnishing of electric energy to the Springfield companies, and a supplementary agreement whereby the Ozark Company agrees to furnish breakdown service from the Empire District Electric Company, complainants' contention that no necessity exists for an auxiliary steam plant at Springfield is upheld, the evidence failing to convince the Commission that any part of the steam plant at Springfield is used or useful for the public, and it is not taken into consideration in allowing a valuation upon which the return is to be based.

Defendant companies claimed that the business had a distinct "going value" of between $60,000 and $137,900—based upon the earnings of the present plant. The Commission holds that a distinction is to be made in the valuation of the properties of public utilities for the purpose of sale or condemnation, which is known as exchange value, and a valuation for rate-making purposes. No proof was offered tending to show that the company suffered early losses, but the record disclosed much evidence indicating that the early losses, if any, have long since been recouped through excessive rates, and that the alleged earnings have been from the electric department and the losses, if any, from the gas and street-railway department. It is the duty of the company to show by competent proof that losses have been incurred, and applying the distinction between sale and condemnation cases and rate-making cases no separate and distinct item for going value is allowed in this case, but the Commission takes "into account the fact that the plant was in successful operation" in fixing the fair value for rate-making purposes.

The Commission in arriving at the rate of return to be allowed states that six per cent is the legal rate of interest in the state and by contract the rate may not exceed eight per cent, holding that seven per cent is a just net return on property invested in public utilities. The rate of return must be determined from the fact of each case.

Under the provisions of the Public Service Commission Law, the Commission is empowered to determine what amount shall be set aside to cover depreciation. The public utility is entitled to earn a sufficient sum to provide not only for current repairs but to make good the depreciation and replacing of parts when they come to an end in their usefulness. For this purpose the Commission makes an allowance of five per cent of the present fair value of the property.

The opinion also states that the citizens of Springfield are entitled to good and adequate electric service and to receive the benefits of their natural location, if any there be, and should partake of the advantages in the reduction of the cost of hydroelectric energy.

On the basis of previous earnings and expenses, the gross earnings of the com-

pany for 1913 were determined as $183,909 and operating expenses as $80,000.

In conclusion, the Commission finds that the fair present value for determining reasonable and just rates in this case of all of the property of the electrical department of defendant Gas and Electric Company, as of date September 30, 1913, is the sum of $300,000, which sum formed the basis for determining reasonable and just rates. The Commission found the rates, as a matter of fact, of the Springfield Gas & Electric Company for electric energy to be unjustly discriminatory and unduly preferential, and that rates should be fixed upon a sliding scale with maximum prices for the various amounts of electric energy furnished to customers. For the purpose of classification, consumers are divided into four classes: (1) residence lighting; (2) general lighting; (3) general power; and (4) large light and power. Other classes or subdivisions of the above classes are reserved for future action should the occasion arise. The Commission found that the operating revenue for 1913 was $185,900; operating expenses, allowance for contingencies and depreciation and return on investment as corrected, $116,000, which justifies a reduction of rates. Analysis of consumers' bills for September, 1913, discloses an average rate of 9.69 cents per kilowatt-hour; an average power rate of 5.5 and an arc-lamp rate of 5.8 cents.

The rates prescribed below are the maximum rates permitted, and are to be in force for a period of three years from July 1, 1914, and thereafter until changed or abrogated by the Commission. For residence lighting the rate is to be 8 cents per kilowatt-hour for the first 30 hours' use of the maximum demand; 5 cents per kilowatt-hour for all excess use. Maximum demand is assumed to be one-half of the connected load. There is a minimum charge of 75 cents per month per meter, and 10 per cent discount is allowed on all bills paid before the tenth of the month.

For general lighting the rates are 8 cents per kilowatt-hour for the first 30 hours' use of the maximum demand; 5 cents for the next 60 hours' use; 3.5 cents for all excess use. Maximum demand is assumed to be three-fourths of connected load. There is a prompt-payment discount of 10 per cent. The minimum charge is 5 cents per month for each 60-watt equivalent, with no charge less than $1.00.

For general power the rates are the same, with maximum demand assumed to be the connected load, and a minimum charge of 75 cents for each kilowatt of connected load.

The large light and power, available to all consumers willing to guarantee a maximum demand of ten kilowatts, the rates are 7 cents per kilowatt-hour for the first 30 hours' use; 4 cents for the next 30 hours' use; 3 cents for the next 60 hours' use; 2.2 cents for all excess use. Maximum demand is determined by demand meter or other exact method; the minimum charge is $1.00 per kilowatt of maximum demand, and discount is 5 per cent.

For street lighting the rates are $60 per inclosed 7.5-ampere series arc lamp per year, operated on moonlight schedule; $6.00 per 40-watt incandescent lamp per year, operated from dusk until eleven o'clock each night. Incandescent light only available when arrangements have been made for the use of fifty or more such lights, covering not to exceed five city blocks for each fifty lights or fraction thereof.

NEW YORK.

Consolidation of Northern New York Power Companies. The Malone Light & Power Company is authorized to issue six-per-cent bonds to the amount of $348,000, and new stock to the amount of $50,000. The proceeds of this sale are to be used to purchase the property, assets, and franchises of the Franklin County Hydraulic Company which owns a hydroelectric generating station, pole lines and other appurtenances. The two companies are then authorized to merge, the Malone company assuming the franchises of the Franklin company.

WISCONSIN.

Racine Water Company. A decision rendered in the United States Court for the Eastern District of Wisconsin upheld the constitutionalty of the indeterminate-permit feature of the Public Utilities Law. The decision permits the city of Racine to proceed with the purchase of the water-works property. The suit was brought by the Farmers' Loan & Trust Company, of New York, to enjoin the Railroad Commission of Wisconsin and the city of Racine from proceeding under the Public Utilities Act to fix just compensation to be paid by the city of Racine and to prevent the city from taking over the water-works plant of the Racine Water Company. The trust company sued as representing the bondholders of the water company and challenged the constitutionality of the indeterminate-permit feature of the Public Utilities Act. No opinion was rendered by the court.

The Coloma Telephone Company applied for permission to increase rates from $10 per year to $1 per month. The Commission authorized a rate of $11 a year where service is paid for one year in advance and $1 per month where payment is not made in this manner.

The Badger Telephone Company was ordered to reconnect its lines running into Hub City with the Hub City switchboard of the Hawkins Creek Telephone Company and the Westford Telephone Company. In order to secure better service the Hawkins Creek Telephone Company is directed to reduce the number of subscribers per line to twelve or less.

The Madison Gas & Electric Company was authorized to issue $808,000 of five-per-cent 30-year bonds. These bonds are issued to replace $444,500 of first-mortgage bonds by sale or exchange at not less than 89.98 per cent of their par value, and also to retire $327,000 of six-per-cent bonds at not less than 89.95 per cent. The order cancels the issue of $400,000 of bonds authorized January, 1911, for a similar purpose.

The Menominee & Marinette Light & Traction Company was authorized to issue $150,000 of stock, proceeds to be used for the retirement of $5,000 of the company's bonds, $123,500 of notes and $21,500 of accounts payable.

The River Falls Power Company was authorized to issue $20,000 of bonds, proceeds to be used in constructing a transmission system from Hastings, Minn., to Pine Bend, Minn., also for the purpose of installing new machinery in the company's hydroelectric station at Clifton, Wis., and for paying off existing indebtedness caused by making additions to the plant.

The Citizens Telephone Exchange was authorized to issue $24,900 of stock for the purpose of extending and improving its plant and system within the city of Sheboygan.

The Dukes Prairie Telephone Company was authorized to issue $20 of stock to replace void stock of a like amount issued in ignorance of the stock and bond law.

The Gillett Rural Telephone Company was authorized to issue $2,850 of stock; $1,050 of this amount is to be used to replace a similar amount of void stock issued in ignorance of the stock and bond requirements, $1,200 to be used in paying for a similar amount of the stock of the Linzy Brook Telephone Company, and $600 to be used in making extension and additions to the plant of the applicant.

The St. Croix Telephone Company was authorized to issue $6,000 of bonds to be sold at not less than 75 per cent of their par value, the proceeds to be used in erecting and equipping its new central office building.

New Brunswick Wireless Station Completed.

The Marconi wireless station at New Brunswick, N. J., has been completed and messages have been sent to the station in Wales. It is expected that commercial business will be handled from this station in the near future.

Legal Notes

What Credit Should Be Given Receivers Appointed by Court.

An important case was recently decided in the Appellate Court of Illinois, entitled Miller versus American Light & Fixture Company (181 Ill. App., 623). As a petition for an appeal was made to the Supreme Court and there denied, the Appellate decision may be taken as having the sanction of the highest court in the state. There were questions involved which had been repeatedly decided in this and other courts and as to which credit men generally are wholly ignorant. In fact, a credit man would assume as a rule that whatever credit was asked by any receiver operating a business, appointed under order of a court of equity, should be granted without hesitation. The contrary, however, is the rule upon which the credit man should act upon such a request. As held in the decision cited, one deals at his peril who extends credit to a receiver, though appointed and authorized to act under order of court. For the court under ordinary circumstances has no responsibility and is not surety for the debts of the receiver, though authorized, nor are the parties to the litigation, nor the receiver, personally liable beyond the assets actually in his possession and control as receiver.

It is necessary, therefore, if doubt exists, that the property in the hands of a receiver should be looked into by a prospective creditor before any credit is extended by him to the receiver under any circumstances. For as a rule, unless the property itself, of which the receiver has good title, proves sufficient upon liquidation to pay all the debts incurred by the receiver in his receivership, including his fees and expenses, the deficit is the amount lost by the trusting creditors and by no one else. The mere fact that the property in the hands of the receiver is insufficient to meet the expenses of the receivership, the court has again and again affirmed, does not render the complainant or party commencing the proceedings and who had the receiver appointed, liable for such expenses.

The Manhattan Electrical Supply Company, of Chicago, and other creditors in this case had extended credit to the receiver appointed and operating under order of court the business of the American Light & Fixture Company in Chicago. Though the receiver had assets, they had not been inventoried by him of record and there was no way of determining from the court records itself to what extent the receiver was entitl d to any credit. This condition existed until the receiver became insolvent and ceased operating the business without reporting to the court either the amount of the assets or the results of his operations. Ordinarily the creditors would have suffered a loss beyond the amount of assets remaining in the hands of the receiver, but in this case the Manhattan Electrical Supply Company, Pass & Seymour, and others employed Messrs. Vose & Page, of Chicago, as counsel, to enforce their rights, if possible, against the parties responsible for such conditions. Upon investigation it was found that the assets had been dissipated and that the suit had been brought by the complainant Miller with the intent of securing a receiver for his own personal ends and not with a view to paying the debts of the concern or to conserve the interests of the creditors, that Miller had been paid a salary by the receiver without order of court and that the court as well as the creditors had been kept in ignorance of the true condition of affairs.

Upon this showing the court referred the matter to a master in chancery, who took testimony and reported the evidence according to the statement of facts as here given. After a hearing before Judge Jesse Baldwin, of the Circuit Court of Cook County, Ill., a decree was entered directing Miller to make good any losses resulting to the creditors of the receiver by reason of the receiver's insolvency. It was then announced as a principle of law that where the receiver had been appointed at the instance of parties through fraud or illegal conduct, that such parties would be liable for all debts of the receiver so incurred in the operation of the business and for the fees of the receiver as well. Upon this principle the decree was entered and an appeal was taken to the Appellate Court of Illinois, where the decree below was affirmed. Miller, thereupon petitioned the Supreme Court of Illinois to grant a writ of error, but the Supreme Court declined to interfere with the decree below and the same was thereby rendered final.

As a result of this litigation, which required some years' time, the debts created by this insolvent receivership were ordered to be paid by Miller, the moving party in the receivership, and an execution against Miller was ordered. Recently this has resulted in the payment of all these claims and the creditors have thus at last been rewarded for their unrelenting persistence. Mr. Pierce, the Chicago manager of the Manhattan Electrical Supply Company and his assistant, Mr. Johnson, gave the matter personal attention and rendered valuable assistance in obtaining these results not only on behalf of their company, but on behalf of all other creditors interested.

The case is especially interesting because it appears, as the Appellate Court stated in its opinion, that no other American case has been decided involving exactly the same point. The rule of equity upon which this decree has been entered, however, was recognized with approval by the late Justice Harlan of the United States Supreme Court in Atlantic Trust Company vs. Chapman, 208, U. S., 360. It is surprising that in so many receiverships so few have resulted where, after the operations, the assets remaining in the hands of the receiver have not been sufficient to pay his fees and expenses.

Decision of the Supreme Court in the case of the $450,000 bond issue of the City of Seattle, Wash., for a municipal steam power plant, upholds the right of city electric plants to sell power as well as light. Opponents of the bond issue claim the issue invalid, since it exceeded the first five per cent indebtedness limit, and provided for the sale of power, not enumerated under the utilities for which a city may issue additional bonds. The Supreme Court holds the power business incidental to the lighting business.

The State Supreme Court has handed down a decision upholding the constitutionality of the public utilities law of Idaho and the legality of the acts of the Commission.

The Commission issued orders shutting the Idaho Power and Light Company out of Twin Falls and the Beaver River Company out of Pocatello for the reason that they have not secured from the Commission certificates of necessity and convenience as provided by law.

Both towns are already served.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 218.—PANAMA CANAL LOCOMOTIVES.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

No. 227.—REWINDING ANOTHER MOTOR.—I have a General Electric one-sixth to one-eighth horsepower, 110-volt, direct-current motor, whose armature core is 3.25 by 3.25 inches and has 12 slots. The commutator has 24 segments. The original armature winding has 150 turns of No. 31 wire; the fields have 550 turns of No. 28 wire. I want to rewind it to run on 120-volt, 60-cycle, single-phase circuit. What size wire and how many turns must be used on the fields and armature?—W. T. E., Ansonia, Conn.

No. 228.—PANELBOARDS.—Are panelboards made in which the three leads are 110-volt three-phase and all the branch circuits single phase, being evenly divided among the three phases? If such a panelboard is not on the market, could one be built with a four-wire, three-phase main, the single-phase branch circuits being connected between the three outer wires and the neutral?—J. B. E., Evanston, Ill.

No. 229.—LIQUID AIR FOR ICE MAKING.—Has liquid air ever been used in place of ammonia in commercial ice-making plants?—W. R. T., Fort Wayne, Ind.

No. 230.—VOLTAGE OF RURAL LIGHTING PLANT.—Is it better to use 32 or 110 volts for a small gasoline-engine-driven lighting plant on a farm 20 miles from the nearest electric station? There is a possibility that transmission line may be built within two years so as to pass about half a mile from the farm house.—B. L., Fargo, N. D.

Answers.

No. 223.—STREET OR STATION INDICATOR.—Is there on the market an automatic device, usable inside of street cars, that will automatically, through electrically illuminated signs in each end or one end of the car, indicate intersecting streets by name as and when the car approaches such intersecting streets, irrespective of the number of such streets, and is the same practicable? Where is such a device used and by whom manufactured?—W. H. W., Kansas City, Mo.

The records of the United States Patent Office show scores of attempts to make devices which will visibly indicate the names of intersecting streets for the benefit of passengers on a street car, these being sometimes operated by the motorman or conductor, and sometimes automatically controlled by the travel of the car. In the former case, an added responsibility is placed on the motorman (who properly should concentrate his attention on the track and the conductor's signals), or on the conductor who may easily disarrange the signals by omitting his actuating the same in time for one crossing. Where the conductor calls out the streets, his skipping one does not matter, but if he is expected to actuate a visible street-name-indicating signal, his being too busy to do so once or twice means that he must then actuate the device two or three times in quick succession, for otherwise the indications thereafter will all be wrong. An apparatus driven from the car axle would avoid this personal element, but with it the rate of changing the indication would have to vary with the lengths of the blocks traversed by the car. In practice, scarcely any city has blocks of uniform length, hence the apparatus would have to be changed for each route, instead of merely requiring the substitution of different street names. Moreover, any departure from the regular route of the car, or switching back and forth, would usually throw such an indicating apparatus out of step with the intersected streets. For these reasons such indicators look much better in theory than in practice, and while the writer has been familiar with many of them as leading to interesting patents (often on apparatus hardly suited to the strains of service on street cars), he has yet to hear of one actually being used successfully.—Albert Scheible, Chicago, Ill.

This is a very attractive proposition for inventors and has been the subject for invention almost since the beginning of electric traction. Many patents have been granted on such devices, the writer having been rather close to the inventor of one of them during its early development. The essential features of most of such indicators are: (1) a roll of paper bearing the names of the streets or stations; (2) a pair of winding drums, the paper passing from one to the other; (3) a step-by-step mechanism to control the movements of the drums which are driven by a small motor; (4) an automatic cutout or timing device to prevent overrunning of the winding drum. Current is supplied to the motor, at the proper intervals, from the trolley wire, or rather from an auxiliary short section of trolley wire with which contact is made by a projecting finger or collector attached to the trolley pole but insulated therefrom and feeding into an insulated conductor which is carried down the pole to the winding motor. The writer does not know of any installation now working, but can give the addresses of two companies which make, or have made, the device, viz., The Acme Indicator Company, Cleveland, O., and the Mann Indicator Company, Alliance O. Information regarding the latter company can be obtained from Albert Stewart, 410 North Euclid Avenue, Pittsburgh, Pa. It is the writer's opinion that the reasons for the failure of traction companies to generally adopt such devices are probably: (1) because they are necessarily somewhat complicated and delicate and inevitably add to the cost of upkeep of the rolling stock; (2) because they are not direct revenue producers. However, some of the inventors attempt to overcome the latter objection by displaying advertisements either on the paper roll between street announcements, or elsewhere on the device.—C. A. H. Pittsburgh, Pa.

No. 224.—SYNCHRONIZING ALTERNATING-CURRENT MACHINES.—(A) In connecting a two-phase or three-phase alternating current generator to a switchboard to which several other machines of the same kind are already connected, what methods may be used to insure getting the new machine in the proper phase relation to the busbars? (B) What is the purpose of the synchronizing resistance connected across the collector rings of a rotary converter while starting from the direct-current end?—P. M. B., Hudson, Ill.

(A) The answer published in the June 27 issue was very interesting, but I believe that P. M. B. wants to know how to make sure that the two machines have the same phase rotation before connecting them in parallel. The simplest way to do this is to connect an induction motor to the new machine and observe the direction of its rotation. Then connect the motor to the buses. If the motor revolves in the same direction in both cases, the phases are all right and you can proceed to synchronize. (B) I think that the "resistance" spoken of is really a synchronizing transformer.—J. H. M., Palo Alto, Cal.

No. 225.—BLAME FOR FACULTY CONNECTION.—A certain building was wired and pronounced O. K. by the inspector. After meter was installed (it was a three-wire job) the lamps connected to the switches on the left side of the switchboard burned out. A test showed that the neutral wire had been connected to the right-hand pole of the entrance switch instead of to the center pole, thus giving 220 volts on the left and 110 on the right. The meter man supposed that the neutral was in the center and, as there was

nothing to indicate the contrary, ran the two outside wires through the meter and onto the switchboard, as is customary. The entrance wires came in through conduit and could not be traced to the outside connections. The owners of the building blame the meter man; we contend that he was not at fault. Who is right?—J. S., New Knoxville, O.

In my opinion the meter man is not entirely to blame; of course, a good practical man usually has a lamp so as to test his circuits before quitting the job. But most meter men have to work under instructions, such as that the neutral is always in the middle and under that impression the meter is connected. I should say the blame may be laid to the one that crossed the wires in the service conduit.—W. T. E., Ansonia, Conn.

In the first place the wireman was to blame for making the faulty placing of wire, as the neutral wire should have been placed in the center instead of to the right-hand pole of the entrance switch. But probably the greatest fault for the connections must be placed upon the inspector who passed a job that was not tested and found perfectly right. After a job is once passed by the inspector, all blame is removed from the wireman's shoulders. By all means the blame must not be placed upon the meter man, because it is his business to connect up the wires to the meter as they should be. As there was no sign to indicate that the wires were placed otherwise than usual and as all jobs are supposed to be right after the inspector has passed them, the meter man did his duty by connecting the wires as they should be if placed right. Therefore the meter man was not to blame.—H. O. P., Beardstown, Ill.

No. 226.—Rewinding Motor.—How can I change a bipolar, 110-volt, direct-current, 250-revolutions-per-minute, series fan motor into a generator giving 10 to 20 volts and about 20 amperes? At present there is wound on each field one-half pound of No. 27 single cotton-covered wire; the armature has 12 slots and 12 bars and 120 turns of No. 30 double silk-covered magnet wire in each slot. I have two machines like this, exactly alike, and wish to make a motor-generator of them by changing one as indicated above.—H. J. G. J., New York City.

The querist has neglected to give the size of the motor in question, but from the size of wire used one would judge it about one-thirtieth horsepower. He wants, however, 20 amperes at 10 or 20 volts, which is equivalent to 200 or 400 watts. These correspond to about one-sixth and one-third horsepower, respectively, so that it would be impossible to rewind for this condition or for the motor which he proposes to use in the motor-generator set to drive a generator of this capacity.—J. H. M., Palo Alto, Cal.

Two powerful wireless stations are to be built on islands in French Oceania. One will be located at Papeete, on the largest of the Society Islands, and the other at Noumea, New Caledonia.

Special Electrical Illumination for New York's Fourth of July Celebration.

The movement for a sane and safe and safe celebration of our chief national holiday was given an impetus in New York City by carrying out on July 4 on a larger scale than in bygone years the special electrical illumination of the city's parks, public buildings and monumental structures. Much study was given to the matter and new and strikingly beautiful effects were produced that elicited universal admiration. Each of the five boroughs of the greater city had some of its parks and public structures attractively illuminated.

In Manhattan alone more than 26,000 red, white and blue electric bulbs were strung through the trees in the parks and along the outlines of buildings. The number of sites originally planned to be illuminated had been largely increased, owing to the interest shown by people of various localities and neighborhood settlements, as well as to the safety movement to supplant the more dangerous pyrotechnical displays with the safer methods of patriotic expression.

In all of the parks where folk-dancing and other forms of entertainment were held there was a very brilliant illumination from 5,000-candlepower and 2,000-candlepower gas-filled tungsten lamps. Among these locations were Battery Park, Hudson Park, Abingdon Square, Washington Square Park, Morningside Park,

Fourth of July Illumination of Washington Arch, New York City.

Illumination of Soldiers' and Sailors' Memorial, New York City.

Hamilton Fish Park, Columbus Park, Crotona Park and Claremont Park.

The schedule for the colored illuminations included DeWitt Clinton Park, Chelsea Park, Seward Park, Tompkins Park, Sailors and Soldiers' Monument, the Mall in Central Park, Washington Arch, Grant's Tomb, Amsterdam Avenue and One Hundred and Fifty-Seventh Street, St. Mary's and St. James' Park in the Bronx, the Bronx County Court House, Bronx Borough Hall, and City Hall, Manhattan. The current for all illumination was furnished free by the New York Edison Company, together with the wiring and lighting of city buildings.

The Mayor's Committee on Illuminations consisted of Arthur Williams, chairman; Nicholas F. Brady, Albert Goldman, Charles F. Lacombe, J. E. Phillips, Eugene H. Rosenquest, Frank W. Smith, C. G. M. Thomas, W. F. Wells, Martin W. Littleton, general chairman; Maurice E. Connolly, president, Borough of Queens; Marcus W. Marks, president, Borough of Manhattan; Douglas Mathewson, president, Borough of the Bronx; George McAneny, president, Board of Aldermen; C. J. McCormack, president, Borough of Richmond; Lewis K. Pounds, president, Borough of Brooklyn; William Williams, commissioner, Department of Water Supply, Gas and Electricity; Alderman Hamilton, chairman, Aldermanic Fourth of July Committee; Alderman Curran, Alderman Dowling, and Dr. Edward Hagaman Hall, secretary, New York Fourth of July Committee.

Fourth of July Illumination of New York City Hall.

The production of coal in Tennessee in 1913 was 6,903,784 short tons, valued at $7,883,714.

Annual Meeting of Electric Power Club.

The Electric Power Club held its annual meeting at Hot Springs, Va., on June 8, 9 and 10. This organization, whose membership is drawn from manufacturers of electric motors and generators has been engaged for the past three years in the very important work of standardizing the ratings of electrical machinery, defining the terms and nomenclature used, and establishing standards in many mechanical details on which uniformity of practice is desirable, such as pulley sizes, speeds, shaft diameters, keyways, etc.

One of the most important matters to come before the meeting was the subject of single rating, and a paper on this subject was read by Charles Robbins.

Single Rating of Electric Motors.

The application of electrical apparatus should be considered from the standpoint of (A) conditions under which it will be called upon to operate in daily service, as concerning time of operation, characteristic requirement of the load, location of the apparatus, method of control, etc.; (B) The capacity of the apparatus under consideration as to the thermal and mechanical limits of the materials used and other characteristic limits of capacity, such as speed—torque—time curves—with special reference to commutation in direct-current motors and limiting torque capacity in alternating-current motors; (C) the desirable basis on which such apparatus should be rated as a basis of contract relations between buyer and seller.

Under service conditions, we find the following generally well recognizable requirements: (1) continuous load; (2) steady load for limited period; (3) varying load with well defined minimum and definite maximum; (4) load varying from minimum to maximum with no particular regularity; (5) load varying through definite cycles of operation; (6) load that may be continuous for a definite period and then require an overload for a short definite period.

Under "B" we should consider the limitations defining the capacity of apparatus, as follows: ambient temperature, 40 degrees centrigrade (instead of 25 degrees as heretofore); hottest-spot temperatures and corresponding permissible temperature rises.

Cotton, silk, paper and other fibrous materials are permitted a 55-degree rise; treated fibrous materials are allowed 65 degrees; mica, asbestos, etc., are allowed 85 degrees.

Temperature measurements may be made by mercury or alcohol thermometers, by resistance thermometers, or by thermo-couples, any of these instruments being applied to the hottest accessible part of the complete machine.

Other characteristic factors of rating are provided for as follows: commutate at 150-per-cent full rated load; stalling torque at 175 per cent.

At present motors are rated as (a) general-purpose motors, rated to carry full load continuously at 40 degrees centigrade, and 25-per-cent overload for two hours with increase in temperature of 15 degrees; (b) motors designed for specific service on which the rating covers only a condition of load applied as provided for in specification or according to nameplate marking; (c) all the motors in the above classes are sold on the basis of highest temperatures thought safe, i. e., 55 degrees; (d) if it is desired to continue the present practice of giving the general-purpose motor an overload rating and guarantee, we must change the present form of guarantee to be within safe limits.

It seems desirable to at this time give motors a single rating which will describe what these machines will do under stipulated conditions as to temperature, stalling, torque, or commutation limits, and then to so rate them that their temperature rise, under the load stipulated on the nameplate marking will be for non-impregnated cotton, 40 degrees and for impregnated cotton, 50 degrees. The motor will then be applied so that the load on the motor will fall within the nameplate rating. In cases where there is a considerable uncertainty as to the value of the load the rating of the motor selected should be high enough to allow ample margin to take care of the maximum load conditions expected without exceeding the safe temperature rise.

In the past electrical machinery has been rated both in terms of load and overload and the relations between the two. The time rating for which the overload was specified and the temperature limits allowed have all been continually subject to revision, requiring frequent redesign in order to meet the changing specification requirements. Single rating is the expression used to define a method of rating elec-

trical machinery which, with the maximum temperature to which different classes of insulation can safely be subjected definitely known and fixed, rates the motor in terms of a single load coupled with a single time.

The tendency both in this country and abroad is towards the single-rating method. It has already been adopted by the International Electrotechnical Commission and is under consideration by the American Institute of Electrical Engineers. All special-application motors used in this country are already so rated, such as crane, elevator, machine-tool, railway motors, etc. Although there is no condition of load or service which cannot be properly expressed in and interpreted by the single-rating method, the bulk of general-purpose motors are now sold with a time-overload rating in addition to the nominal rating, and it was recognized that any immediate change of practice would cause considerable confusion in the trade. The members of the Electric Power Club unanimously adopted a resolution expressing entire concurrence in the principle of single rating and instructing the different commitees to constructively work towards the single-rating method in all standardization work during the coming year. Recognizing the valuable work that the American Institute of Electrical Engineers is also doing in this same direction, the committees were instructed to work in thorough co-operation with that body.

Francis B. Crocker, president of the Club, recently submitted a paper[1] to the members giving his views on the proper line of demarkation between the standardization work of various associations whose interests are more or less closely allied. There was considerable discussion of this paper at the meeting and uniform approval of the view given by Professor Crocker. Applying his ideas to the standardization of electrical machinery, the work of the American Institute of Electrical Engineers would be in general that of establishing broad engineering and technical limits within which such machinery should be designed but, provided these limits were not exceeded, the exact basis of commercial rating to be used should properly be left to such an organization as the Electric Power Club, as the manufacturers of electrical machinery are naturally more familiar with any limitations in manufacture which might exist as well as with the necessity of adopting for certain classes of apparatus greater conservatism in the basis of rating than is required where the conditions of load and service can be definitely determined.

A report was read indicating that the National Board of Underwriters had shown a desire to give thorough co-operation and that the Board was ready at any time to appoint a committee to deal with a committee of the Electric Power Club on all matters affecting the design, installation or use of electric motors and generators from the standpoint of fire risk.

A resolution was adopted approving House Bill No. 16480 now in congress, which provides for various improvements in Patent Office facilities, increased salaries, a greater number of examiners and other features tending to expedite the work of that office.

The Standardization Committee through its sub-committees recommended a number of standards which were adopted at this meeting. In addition to 115 and 230 volts previously approved, 550 volts was adopted as a standard voltage for direct-current motors. Similarly 600 volts was adopted as a standard direct-current generator voltage in addition to 125 and 250 volts. The standard voltages for alternating-current generators were revised to 240, 480, 600 and 2,400 volts. The standards previously adopted for alternating-current motors had been confined to polyphase motors, and at this meeting standard voltage ratings, temperature ratings, and name-plate markings were adopted for single-phase motors.

STANDARD PULLEY SIZES.

Motor Rating in Horsepower. Speed in Revolutions Per Minute.				Pulley.		Shaft.		Keyway.	
1800	1200	900	600	Diameter.	Face.	Diameter.	Length.	Width.	Depth.
2	1			4	3	1	3½	¼	⅛
3	2			4	3	⅛	3		
5	3			5	4	1⅛	4	⅜	⅛
7.5	5			6	4	1⅛	5		
10	7.5	5		7	5	1⅜	5½	⅜	⅛
15	10	7.5		8	6	1⅜	5½		
20	15	10		9	7	2	6		
25				10	7	2⅛	6½	½	¼
30	20	15		10	8	2¼	7		
40	30	20	15	11	10	2⅜	7½		
50	40	30	20	12	11	2½	8		
	50	40	30	13	12	2⅝	8½	⅝	⅛
	75	50	40	14	12	3	9½		
	100	75	50	16	13	3¼	10½	¾	⅜

The accompanying table gives standards previously adopted for the diameter and face of pulleys for motors of different capacity and speed. The shaft diameter, shaft length and keyway size shown in this table represent the recommendation of the committee on this subject and have been submitted to the manufacturers for careful consideration before adoption.

All standards as adopted are printed in the Book of Standards of the Electric Power Club. This book contains much valuable information on standard ratings of electrical machinery, speeds, guarantees, nomenclature, etc. Copies can be obtained from C. H. Roth, secretary, 1410 West Adams street, Chicago, Ill.

At the close of the meeting Francis B. Crocker was re-elected president. Professor Crocker has been closely associated with both the technical and commercial phases of the electrical industry from its inception and was chairman of the first Standard Committee of the American Institute of Electrical Engineers. He has done valuable work in connection with the technical standardization originated by that body and is well qualified both from experience and association to lead the work of industrial standardization which is being undertaken by the Electric Power Club.

LETTER TO THE EDITOR.

Belt Slip and Power Loss.

To the Editor:

Mr. E. G. Fox, in his excellent article "Electricity in Woodworking Plants," in your June 13 issue, says: "Speed losses of 10 to 20 per cent are very common with shaft and belt drives."

This is an alarming loss in speed and I wish to enlarge on it slightly because it represents a corresponding loss in power, and power costs money. This is a point that Mr. Fox apparently overlooked.

Let us suppose that the drive wheel is 20 inches in diameter and that it turns at a speed of 400 revolutions per minute. It is belted to a second pulley of the same size which turns only 380 revolutions per minute. Twenty revolutions per minute, or five per cent of the revolutions, are lost in slip and creep, and five per cent of the power is therefore lost, because pulley slippage occurs inside of the belt in just the same way as in a Prony brake. Power loss is therefore directly proportional to the per cent of slip, and where, as Mr. Fox states, the speed loss is as high as 20 per cent, the power loss is 20 per cent *plus the frictional losses in bearings and in windage.*

Hence it is important, where shaft drive must be used, to keep the belts from slipping as much as possible. Keep the belts in good condition. Don't let them get dry and hard. There are conditions where belt drive is best as Mr. Fox no doubt knows, but my point is, if you have a belt, make the most of it. Do not permit needless slip.

N. G. Near.

New York, N. Y., June 30, 1913.

1 See page 639 of the issue of March 28, 1914.

Main Exhibit Palaces of Panama-Pacific International Exposition Completed.

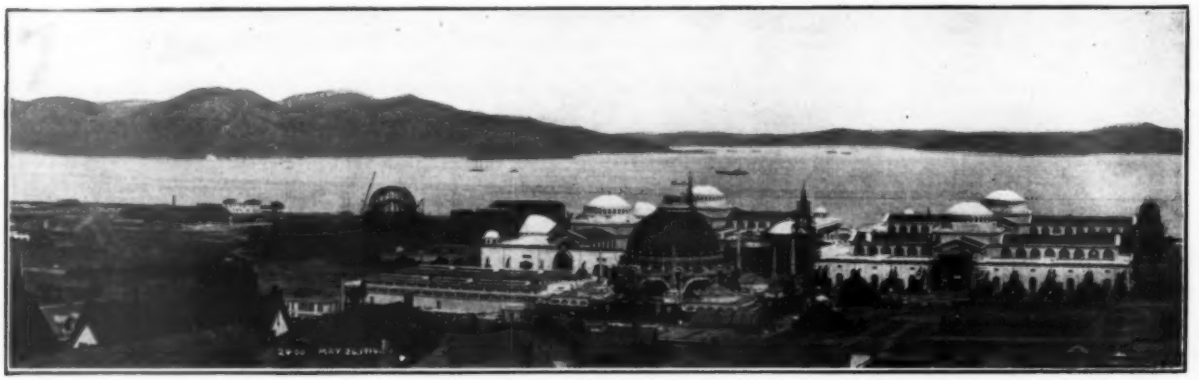
Nine of the eleven principal exhibition buildings of the Panama-Pacific International Exposition, at San Francisco, Cal., have now been completed and turned over to the officials having charge of the placing of exhibits. It is expected that the two other large structures will be finished within a few weeks. This closes the first phase of the exposition activities, and the installation of the first exhibit, which was placed on May 27 in the Palace of Machinery by the Busch-Sulzer Brothers-Diesel Engine Company, marked the beginning of the second period, which will end with the formal opening of the exposition on February 20 of next year.

The two accompanying illustrations are parts of a large panoramic view recently obtained of the main exhibit section of the exposition. The steel framework of the Palace of Fine Arts is seen at the left near the Golden Gate; this is a fireproof structure. The five completed exhibit buildings facing the harbor from left to right are the Palaces of Food Products, Agriculture, Transportation, Mines and Metallurgy, and on the extreme right the Palace of Machinery. In the middle row, proceeding from left to right, the completed buildings are the Palaces of Education, Liberal Arts, Manufactures, and Varied Industries, which latter is opposite the south portion of the Palace of Machinery. The large structure shown in the immediate foreground at the left is the Palace of Horticulture; the steel dome of this structure is 186 feet high and 152 feet in diameter; this is surmounted by a cap 26 feet high. This dome has now been covered with wired glass.

In the center foreground is seen a portion of the semi-tropical South Gardens. In front of the exhibit palaces facing the harbor is a great seat espanade known as the Marina, which is 400 feet wide and elaborately landscaped. The steelwork seen in the center of the group between the Palaces of Literal Arts and Manufactures is the lower skeleton of the spectacular Tower of Jewels, which will be 435 feet high. Proceeding northward from the South Gardens visitors will pass through a huge archway 125 feet high, into what is called the Grand Court of the Universe.

To the left of the section shown in the double picture herewith is the large stretch devoted to the pavilions of different nations, and the buildings of the states. To the right of the section shown is the district devoted to concessions and amusements. At the present time 36 nations have accepted the invitation to take part in the exposition, which will close on December 4, 1915.

Of special interest to electrical men should be the Palace of Machinery, in which will be housed what is believed will be the finest collection of electrical and machinery exhibits ever assembled under one roof. In connection with the exhibits in this building, there will be the most modern methods of illumination. It is planned to make as many of the exhibits as possible include machinery in motion, and all such exhibits will be provided with the latest "safety-first" devices and safeguards to prevent visitors and spectators from being harmed.



Left Half of Panoramic View of Exhibit Palaces, Panama-Pacific International Exposition.

Right Half of Panoramic View, Panama-Pacific International Exposition.

Arc-Lamp Street Lighting Insisted On.

The Kentucky Public Service Company, which has the contract for supplying the street-lighting service in Frankfort, the capital of Kentucky, will be required to live up to the terms of its contract, according to a recent order of the City Council. This contract calls for arc lamps of 2,000 candlepower and the Council has notified the company that it must comply with the contract provisions within 90 days. The company proposed some time ago to substitute a system of incandescent lamps for the type specified in the contract.

New Electrical and Mechanical Appliances

Branch Fitting for Metal Molding.

For convenience in connecting a branch circuit to metal molding there has been placed on the market a new fitting known as the Klein Ememtap. This fitting permits the making of a branch connection on existing installations without disturbing the metal molding, only the cap there-

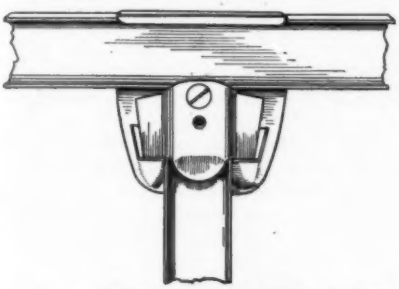


Fig. 1.—Securing Branch Fitting to Main Molding.

of being removed. The fitting can be secured at any place and may be easily shifted by loosening the screw in the metal clamp. It does not have to be fastened to the ceiling and the metal molding does not have to be lined up. There is no need for splicing, soldering or taping because the connecting block permits making an approved connection.

The manner in which these desirable

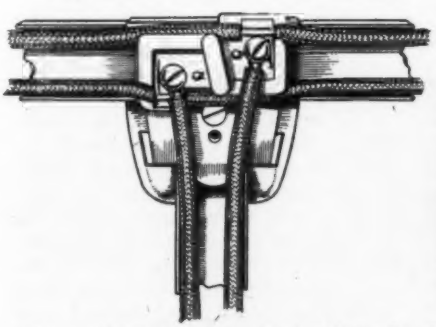


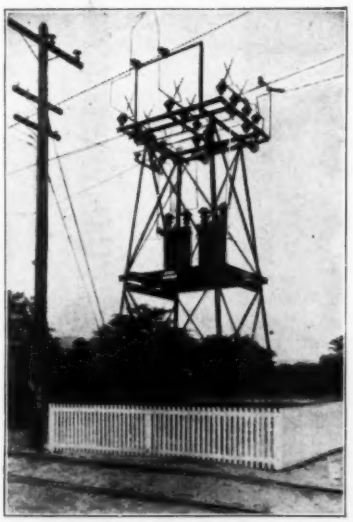
Fig. 2.—Connection Completed and Ready for Capping and Cover.

features are attained is shown from the accompanying illustrations. The metal back of the fitting is placed under the metal molding and the branch line of molding is fastened to the main line by means of the metal clamp of the fitting, as shown in Fig. 1. A small section of each of the main-line wires is skinned and placed under the lug of the porcelain connecting block. The wires for the branch line are then placed under the heads of the screws. By tightening the latter both the main-line and branch-line wires are securely tightened at the same time. When these connections are made, as shown in Fig. 2, the capping of the metal molding is replaced, and the branch connection is covered with the porcelain cover of the fitting. This completes the job.

This fitting insures making a neat connection with the minimum of time and labor. It has been placed on the market by S. Robert Schwartz & Brother, 624 Broadway, New York City.

Outdoor Substations on Indiana Transmission Lines.

The demand for lighting and power service along the lines of the Terre Haute, Indianapolis & Eastern Traction Company, is being met by the installation of outdoor high-tension substations of the type shown herewith. The initial installation usually consists of



Outdoor Substation for Terre Haute, Indianapolis & Eastern Traction System.

a single transformer, but as the load increases two transformers are connected in open delta, the third unit being added to secure the full capacity of the station when needed.

The secondary distribution is 2,200 volts along the right of way, ordinary distributing transformers being installed at the premises of consumers desiring lighting. When power service is desired and the load justifies it, a third wire is added to the distributing system and separate power transformers installed at the point of service.

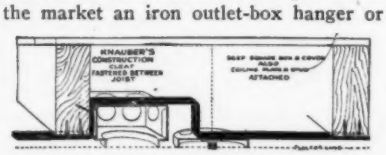
The installation shown was designed by and installed under the supervision of J. A. Norman, chief electrician of the power company, which is installing a number of high-tension extensions from its transmission systems. The switching, fusing and protective equipment is of the standard type manufactured by the Delta-Star Electric Company, Chicago, Ill., the transformers being of the outdoor Westinghouse form. The general design and attractive appearance of this installation is worthy of note and reflects credit upon the power company.

Knauber's Construction Cleat or Outlet-Box Support.

Much time is usually consumed in electrical installations in finding suitable means for supporting outlet and switch boxes. The customary practice of securing these to a two-by-four-inch or similar wood cleat frequently involves controversies with carpenters on the job

Knauber's Construction Cleat.

as to the use of this lumber when the electrician has not the material at hand. Such cleats have to be fitted and securely mounted in place, otherwise the outlet or switch box will not have the proper alinement. All of this involves much needless waste of time and effort, to remedy which there has been devised and placed on the market an iron outlet-box hanger or



Use of Cleat for Outlet Box and Ceiling Plate.

support known as Knauber's construction cleat.

As shown in the illustration, this consists of a single piece of strap iron bent to take any standard outlet or switch boxes, ceiling or bracket plates, etc. It is perforated with holes for mounting the cleat at any desired position, between floor joists, wall or partition supports. The offset portion of the cleat is conveniently arranged so that the outlet box

can be readily secured to it, for which two stove bolts are provided with each cleat. The cleats are light in weight but very strong. They make the outlet box absolutely level and flush with the finished plaster. Single or gang switch boxes and bracket outlets can be readily and correctly attached to even two-inch partitions. The cleats can be used with round, square, deep or shallow standard boxes and with ceiling plates for any standard fixture stud.

These cleats have been manufactured and placed on the market by Alex. M. Knauber & Company, 742 South Euclid Avenue, Oak Park, Ill.

National Carbon Company Announces Plan for Profit Sharing.

The National Carbon Company, which has entered the class of concerns offering stock on the profit-sharing plan to their employees, has announced its plan for the first subscription. The plan provides that $500,000 of the common stock be set aside for sale to employees. The stock will be offered at par, or $100, payments to be made in installments and not to be paid for in less than three years or more than five. The subscriptions will be governed by the annual salary received by each subscriber, those receiving $500 per year or less being entitled to subscribe for one share, those receiving between $500 and $1,000, two shares, and those receiving between $1,000 and $1,500, three shares. The subscription plan is to be dated July 15, 1914.

From the time on which payments begin and during the continuance of these payments, dividends (at the rate of 6 per cent per annum at present) will be credited to the account of the subscriber the same as any other stockholder. Interest on deferred payments will be charged at the rate of four per cent to the account of each subscriber at the end of every three months. Subscribers will each be credited with a bonus of $5 a year per share of stock subscribed for, the first credit to be made on July 15, 1915, "provided the subscriber remains in the continuous employ of the company and shows a proper interest in the company's welfare." Upon cancellation of the subscription or closing of a stock account except by payment in full bonus shall be discontinued. To a subscriber whose stock has been fully paid for in less than five years, bonus will be paid in cash for the full five-year period. The subscriber will receive upon payment in full for his stock a stock certificate, for the shares purchased, but until such time the stock shall be voted by the trustee or trustees.

It is figured that with the bonus and dividends and payments at the rate of $1.00 per month one share of stock will be paid for in four years and eight months. In case the subscriber leaves the employment of the company or cancels his subscription before his stock has been fully paid for, his account may be canceled at the option of the company. There will be returned to him the exact amount he has paid with interest at four per cent. The same ruling will go into effect at the death or permanent disability of the subscriber, except that in the latter case the company has the option of permitting the payments to be completed and issuing stock certificates in the matter provided.

New Units for Ornamental Street Lighting with High-Candle-Power Mazda Lamps.

An attractive line of fixtures, designed for operation of the new sizes of Mazda series lamps for "White Way" or ornamental street lighting, is now being made by the General Electric Company.

These new fixtures are termed Novalux ornamental units, and are made for both

Novalux Ornamental Street-Lighting Units.

series and multiple operation. They will accommodate the 400 and 600-candlepower, 6.6-ampere and the 600 and 1,000-candlepower, 20-ampere sizes of the series Mazda, and the 400, 500, 750 and 1,000-watt multiple Mazda lamps, all of these being of the gas-filled tungsten type with efficiency ranging from 0.7 to 0.5 watt per candlepower.

They are made in two general styles, the only difference, however, being in the glassware equipment. The glassware on one style, known as Form 4, consists of a medium alabaster globe, which is so shaped that it is completely filled with light and permits a certain amount of light to pass upward and illuminate the building fronts. There is a small reflector placed at the top and inside of the globe. The function of this reflector is to direct downward and make useful the light that would otherwise be lost in the bottom of the ventilator surmounting the globe.

The other style of unit, known as Form 5, has a two-piece globe. The bottom part is made of crystal-roughed-inside glass, while the top is made of Pyro glass. No reflector is used, as the Pyro top is made of dense glass having the inside glazed, thereby reflecting downward some of the light, although enough filters through to illuminate properly the building fronts.

These new units are highly ornamental, and the casings, which are designed to form the capital of the pole, are made in four different styles, from which a selection can be made to harmonize with the pole design.

As ventilation is a very important feature in fixtures designed for the new types of Mazda lamps, this matter has been given very careful attention. Air enters through small holes in the globe seat and leaves, in the case of the Form 4 unit, through concealed openings in the spun copper ventilator at the top of the globe; and, in the case of the Form 5 lamp, it leaves through the space provided between the top and bottom globe. The socket used in these fixtures is made in skeleton form, which permits a circulation of air to all parts.

As the efficiency of the 20-ampere Mazda series lamps is much higher than that of the 6.6-ampere lamps, many of the Novalux ornamental series units contain an internal individual compensator mounted inside of the ornamental casing.

These compensators operate the 20-ampere lamps on 6.6 or 7.5-ampere circuits. This saves about 30 per cent of the energy required to operate the lamps and permits them to be connected in standard existing circuits, thereby allowing the extension of the lighting system without additional station equipment.

The compensator also reduces the effect of destructive current surges that may be set up by arcing or permanent grounds. Two different sizes of compensators are made for use, respectively, with the 600 and 1,000-candlepower 20-ampere series Mazda lamps and are equipped with taps for operation on either 6.6 or 7.5-ampere series constant alternating-current circuits. The series unit is mounted on a strain insulator whose function is to keep high voltage from the poles.

The multiple Novalux ornamental units are similar to the series, except that the strain insulator is replaced by a cast-iron adapter of similar dimensions and no compensators are used.

Exports of copper for the month of June totaled 35,182 tons; same month last year, 27,808 tons.

Detroit Insulated Wire Company Reorganization.

The Detroit Insulated Wire Company, of Detroit, Mich., announces the following official reorganization as of June 25, 1914.

Joseph H. Hunter, president of the company, was one of its original incorporators, served as vice-president and general manager and succeeded to the presidency on February 20, 1914, the present prominence of the company in the wire field being due to his efforts. Mr. Hunter was formerly vice-president and general manager of the National Cable & Wire Company, and has been identified with electrical matters and manufacturing for many years.

J. G. Splane, the new vice-president, is a Pittsburgher by birth, in which city he received his education and is a graduate of the University of Pittsburgh. He held a responsible position with the Standard Oil interests from 1887 to 1903, and on May 18 of that

Joseph H. Hunter.

year was elected president of the Pittsburgh & Allegheny Telephone Company. As a protective measure on the part of the minority stockholders, Mr. Splane and the Honorable William Flinn were appointed receivers for the company on January 10, 1911, and on June 1, 1914, the property was re-transferred to its stockholders and the receivership terminated, Mr. Splane at that time being named managing director of the company. By reason of his connection as director with several manufacturing enterprises, his diversified business experience and his acquaintance in the telephone field, Mr. Splane's association with the Detroit Insulated Wire Company should be of great benefit to that company, and such a result is confidently anticipated.

James Inglis becomes chairman of the Board of Directors, he having been connected with the company as a stockholder since its inception. Mr. Inglis' business career practically originated with the American Blower Company, he being identified with that company since early manhood and as its president for the major portion of the time, and under his management it emerged from comparative insignificance to its present pre-eminent po-

James Inglis.

sition. He is also a director of the National Bank of Commerce and the Michigan Savings Bank, was one of the organizers of the Detroit Board of Commerce and its president from April 1, 1906, to April 1, 1907, and is also financially interested in and officially connected with a number of other going concerns. Mr. Inglis lends to the Detroit Insulated Wire Company his broad and well balanced business experience, and while his official connection with the company is largely in an advisory capacity (his energies continuing to be devoted to the American Blower Company), it is felt the moral effect of his official association with the Detroit Insulated Wire Company

C. C. Gray.

will make for added strength and influence.

C. C. Gray, the secretary and treasurer, has had charge of its selling activities since September, 1912, and formerly held a similar position with the National Cable & Wire Company.

W. G. Dalgleish, the assistant secretary and treasurer has been advanced from an inferior position with the company through diligence and merit.

The new official arrangement is looked upon with much favor, and it is confidently expected that the company will profit largely by the change.

Are You Using the Best and Cheapest Coal?

Each summer the United States Geological Survey issues a small pamphlet giving analyses made by the Bureau of Mines of the coal samples that the Survey has collected during the year. These analyses are made for the purpose of obtaining data upon which to classify and value the public lands, and for general information regarding the various coal fields of the United States.

The latest pamphlet of this series of the Geological Survey (Bulletin 541-K) gives the analyses of 135 samples collected by uniform methods in

J. G. Splane.

Alabama, Colorado, Illinois, Kentucky, Montana, New Mexico, Oregon, Pennsylvania, Utah, Virginia, West Virginia, and Wyoming. Most of the samples were obtained in working mines and therefore represent the actual coal that is mined and reaches the market; but a few were collected from surface exposures or old prospects, and the analyses of these samples have only a doubtful value and should be used only as indicating the quality of the coal. They should not be accepted as final until they have been checked by the analysis of fresh material.

The tested heating value is given with almost all the analyses, so that it is easy to determine which of two coals is the better. The bulletin also gives a brief description of the samples, including a section of the coal at the point sampled, and an outline of the different classes of coals recognized by the Geological Survey.

New Haven Electric Locomotives Prove Adaptability to Railroad Switching Service.

Steam-railroad engineers, while reluctantly admitting the adaptability of electric locomotives to passenger-terminal service, are still asserting that this type of engine is not practicable for freight terminals where almost countless switching movements are required in the complex freight yards adjacent to large cities. An account of the successful service given by the electric freight locomotives of the New Haven system is therefore of peculiar interest.

Approximately eight million people are served by the New York, New Haven & Hartford Railroad in rendering service to the New England States. Of all freight hauled in and out of New England by rail, this road handles 75 per cent. The majority of this freight is carried via the Harlem River Division and the Harlem River and Westchester freight and transfer yards.

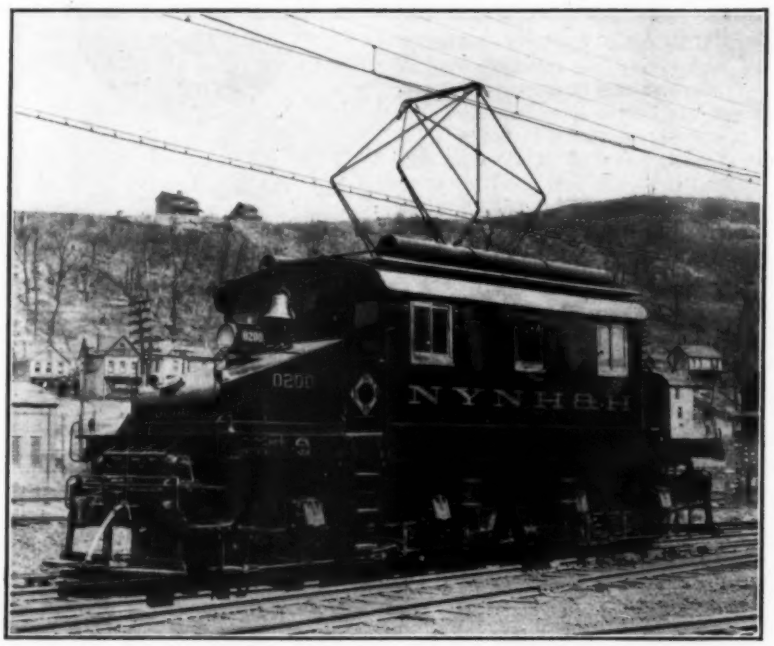
Although the extended electrification of the New Haven road between New York and New Haven has not yet been placed in complete electrical operation, the switching of all freight cars between Stamford and Harlem River has been done successfully by electricity for approximately 18 months. The economies obtained by the use of the electric switcher locomotives have exceeded all the expectations of those who are responsible for their application to this field. The reliability of this switcher-locomotive equipment has proven to be far superior to the steam locomotive in switching service. The operation of these electric switcher locomotives is a source of satisfaction to the operating department and trainmen who have this work in charge.

The three main switching yards on the New Haven system are: Harlem River Yard, length 23.3 miles; Oak Point Yard, length 37.16 miles; Westchester Yard, length 22.29 miles. There is also the Van Nest Yard, which is used for storage only.

In March, 1911, the first switching engine was placed in operation at Stamford, Conn.; in August, 1912, the first switcher started to work in the Westchester Yard; in September, 1912, the first in the Oak Point Yard in float service, and in August, 1913, the first began its operation in the Harlem River Yard proper.

The service performed by these locomotives in the Oak Point Yard is of special interest. This yard is the terminal where all the cars on floats destined to the New England States are unloaded. Each float is properly docked and secured. There are two large controlling bridges at this terminal, one having accommodations for five floats, and the other for three. These bridges contain all of the counterweights used to compensate for the weight of the individual gang or approach bridges, besides all control apparatus necessary for the proper operation of these float docks.

The entire gang bridge to each float is hinged onto the main land. The bridge consists of two parts connected by a hinged joint. Each of these two parts of the approach bridge leading to a float is raised and lowered electrically by means of two controllers. In addition to these controllers, there are two controllers which manipulate two motors connected to a friction drum which by means of a rope holds the floats in their slips securely to the gang or approach bridge.



Baldwin-Westinghouse Alternating-Current Switching Locomotive for New Haven System.

It requires six movements to unload a float and dispatch a train to the yard; also six movements are necessary to load a float. When either loading or unloading floats, there are always two flat cars coupled between the electric switcher locomotive and the cars being hauled on or off the float. In this way the locomotive always remains on land and is never supported by the approach and the two flat cars act as an arm for reaching the train. Each float has three tracks, two with a capacity for eight cars and a center one for six cars. In this float service it is important to load and unload cars so that the floats do not capsize.

To date not a single feature has developed in which the electric locomotive has not been found superior to the steam locomotive in switching service at the floats or in the regular freight yards. The ease with which electric locomotives are controlled, the elimination of stand-by losses and those that are necessary where coal and water are used, elimination of liability for freezing up in cold weather, are all features which are to be credited to the electric locomotive.

Six single-phase electric locomotives do the work of approximately twice the number of steam locomotives formerly used. A total of eight of these electric locomotives are sufficient for practically all of the switching work between Stamford and Harlem River station. These are kept in service 24 hours a day, each making on the average of approximately 140 miles in 24 hours with three eight-hour crew shifts. The electric locomotives handling the work between Westchester Yard and Harlem River for a given month made 38,000 locomotive-miles and consumed approximately 896,000 kilowatt-hours of electrical energy at the locomotive.

During this same period, the six locomotives handled approximately 65,000 cars, which had a total weight of approximately one million tons. Practically all of these cars were transferred from floats and since the control of the electric locomotive is more sensitive than the control of the steam locomotive, this is a feature that appeals strongly to the operators.

All of the heavy freight tonnage mentioned above is handled within the corporate limits of New York City, and the elimination of smoke by the

use of the electric locomotive is another advantage which has appealed to all parties.

There are sixteen switching locomotives included in this installation. Each locomotive is equipped with four Westinghouse 125-horsepower, 25-cycle, single-phase motors and unit switch control. These locomotives each weigh 80 tons and are able to exert a maximum tractive effort of 40,000 pounds with a clean dry rail. The switching locomotives are guaranteed to exert a maximum tractive effort of 36,000 pounds for about three minutes at speeds up to 6 miles per hour and a continuous tractive effort of 14,800 pounds at a speed of 11.5 miles per hour. In practice it has been found that an electric switching locomotive can do the work of two steam locomotives because it can be operated both day and night.

Arrangements have been made for a large bridge, known as the Interconnecting Railroad Bridge, between Harlem River and Long Island City, which will physically connect the Pennsylvania and New Haven systems. Electricity as a motive power will be used entirely for handling all traffic over this bridge.

The 16 swtiching locomotives are of the eight-wheeled articulated-truck type with central cab and sloping ends. Each end of the armature shaft is equipped with a pinion which meshes with a steel-tired gear. These gears are mounted rigidly in a quill which surrounds the axle with a clearance sufficient to allow vertical wheel play. The quill is carried in journals formed in the motor frame. The motor tractive effort is transmitted from the gears to the wheels through helical springs, rigidly attached at their ends to the wheel center and gear center, respectively. With this arrangement, the motors are spring supported, and the center of gravity of the locomotive is at a suitable height above the rail.

As these locomotives operate on the New Haven tracks only, no provision has been made for collecting current from a direct-current third rail. The cab, which is of the steeple type, is built of steel plates with the main portion 17 feet 8 inches long. An operating equipment is placed at each end. Part of the apparatus is hung from the roof. Access can easily be had to transformer, compressor, and other control apparatus. The end motors, which are located under the sloping hoods, can be handled by a crane after removing the hoods. All the motors can be dropped into an overhauling pit.

The railway motor is of 'the series type with short-circuited compensating winding and preventive resistance leads to the armature circuit. The motor is designed with eight poles. The main field winding consists of concentrated field coils, each of which has a few turns of heavy copper strap, and is in its general construction very similar to the field coils used in large direct-current railway motors. The auxiliary or compensating winding is distributed in the slots provided in the pole pieces. It consists of heavy copper bars, one in each slot, and straps interconnecting these bars at the ends.

The armature winding consists of heavy copper strap, and the resistance leads in the armature are made of strap of high-resistance materials. It will be noted that windings are made of bars or straps, and are, therefore, of a very strong and reliable structure, a feature which is exceedingly desirable for railway work. This is combined with the fact that the compensating winding is short-circuited, whereby the voltage strains in this winding are practically eliminated, and the fact that the voltage of the motor is very low (on the average 190 volts), far below the customary voltages on direct-current railway motors, makes this motor as reliable a structure as can be imagined at the present state of the art.

The motors are connected in two pairs, so arranged that the two motors of each pair are permanently in series, while the two pairs are permanently in parallel. The speed regulation is obtained by connecting the motors to different taps on the secondary winding of the transformer in the same way as is done on all the previous New Haven locomotives.

The control is exceedingly simple, because the switching locomotives are not required to operate on direct current. In addition to the circuit-breaker for shutting off the high-tension power from the transformer, the main-circuit control apparatus consists merely of a single switch group having twelve unit switches together with three preventive coils and two reversers. As in all of the previous locomotives, the switches are of the Westinghouse standard pneumatically operated type, using the compressed air of the braking system as an operating force, and a small 20-volt storage battery for actuating the magnet valves. The battery is charged by means of a small motor-generator set which consists of a single-phase motor and direct-current generator. As a rule, this set furnishes all of the energy required for operating the controller circuits, the battery being merely allowed to float on the line ready for use in case of accident or other emergency.

These locomotives are controlled by means of a master controller located in each side of the cab. One of the locomotives has been built with a single controller in the center of the cab and provided for operation in either direction.

An ammeter is provided near each master controller to enable the engineman to know just what load each pair of motors is taking at any time, so that he can handle the locomotive to the best advantage. In the case of a switching locomotive it is especially desirable to know the temperature condition of the motors. For this reason, there has been installed a temperature indicator which is built on the principle of the Wheatstone bridge. The connection of this instrument is made through a coil in the motor fields. Its indications are obtained only when the motorman presses a button which is in the circuit of the control battery. This indicator has been in satisfactory operation since May, 1911. A novel feature in the main circuit connections is that the motors are operated from a two-coil transformer instead of an autotransformer, thereby reducing the insulation strain on the windings to a minimum.

Electric Vacuum Cleaners to be Used Extensively for Cleaning Pullman Cars.

Eight negro men are cleaning 30 Pullman cars every day at Memphis, Tenn., doing work that a whole army of car cleaners had been doing at that point before the Pullman Company installed electrically driven vacuum cleaning equipment in the railroad terminals in that city. There are four of the new machines in use in that city, each operated with a one-horsepower motor directly connected, and the cleaning process is accomplished with perfect sanitation and dispatch.

According to W. H. Bucher, Memphis manager for the Pullman Company, the company is making its first test of the new system in that city and eventually will install similar equipment in all the terminals of the country for the use of its car cleaners. In Louisville, Ky., the terminals are being wired now to supply the power for driving three or four such cleaners which will be put to work soon in that city.

The cleaning process is begun by turning the cleaner first on the tops and outside of the car, used as a blower to remove the dust and soot that has collected. This being finished, the motor is reversed, the tube readjusted and the inside of the car attacked, the cleaners operating then on the suction principle. The seats and carpets are gone over thoroughly, the two negroes to whom each car is entrusted completing the task in less than two hours.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ATTACHMENT PLUGS, Fuseless.—Chapman & Walker, Limited, submitters. Manufactured by **Sterling Telephone & Electric Company, Limited,** London, England.

"OK" 660 watts, 250 volts, catalog No. A-940.

Approved June 10, 1914.

FIXTURES.—Charles W. Leveridge, Incorporated, 183 Greenwich Street, New York, N. Y.

"L & L" show-case and show-window fixtures, for tubular medium-base lamps. Main supply wires of No. 14 B. & S. gauge with slow-burning insulation.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories, and passed by Underwriters' Laboratories, Inc., have labels attached.

Approved June 4, 1914.

FIXTURE PARTS.—Illinois Electric Company, 308 West Madison Street, Chicago, Ill.

"Illinitube." Protected flexible pendent and portable fixtures, made up complete with approved fittings.

Approved June 10, 1914.

FIXTURE WIRE.—Standard Underground Cable Company, Westinghouse Building, Pittsburgh, Pa.

Marking: Green thread woven in braid in a clockwise direction.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories, to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to coils.

Approved June 2, 1914.

FLEXIBLE CORD, Portable, for Electric Heaters.—General Electric Company, Schenectady, N. Y.

Markings: Red and black threads parallel in asbestos braid.

Double or triple-conductor cords composed of braided conductors with rubber and asbestos coverings, the several conductors separately protected by woven cotton braids and enclosed by an outer glazed cotton covering.

Approved May 23, 1914.

HEATERS, Electric.—Hotpoint Electric Heating Company, Ontario, Cal.

"Hotpoint" pressing iron, Model H, 6 pounds, not over 250 volts. This iron has a pressed-steel extension at the heel end serving as a stand when the device is not in use.

The general design and workmanship shown in the construction of this "Hotpoint" iron and accompanying stand is approved.

Approved May 29, 1914.

INSULATING JOINTS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., for **The Yost Electric Company,** Toledo, O.

"Yost" insulating joint.

Insulating joints shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 9, 1914.

MOLDING FITTINGS.—Ernest Klein & Brother, 44 Fulton Street, New York, N. Y.

"Ememtap" for National metal molding.

A T-tap consisting of a steel plate and clamp for securing the molding, a tap block for securing the circuit wires and a porcelain cover.

Approved May 22, 1914.

PICTURE MACHINES AND APPLIANCES.—Enterprise Optical Manufacturing Company 564 West Randolph Street, Chicago, Ill.

Catalog No. 1,002-A, for hand operation.

Catalog No. 1,002-Chicago, equipped with complete film inclosure from magazine to magazine, automatic shutter, spring-hinged magazines, film gate, and provided with special motor supplied by Enterprise Optical Manufacturing Company.

Approved May 29, 1914.

RECEPTACLES, For Attachment Plugs.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Surface type 10 amperes, 250 volts, catalog Nos. 5937-39 inclusive, 6065-68 inclusive.

Approved June 9, 1914.

RECEPTACLES, for Attachment Plugs.—Chapman & Walker, Limited, submitters, Toronto, Canada. Manufactured by **Sterling Telephone & Electric Company,** London, England.

Edison type, 660 watts, 250 volts, catalog No. A-931.

Approved June 2, 1914.

RHEOSTATS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H", all capacities, 115, 230 and 500 volts. Motor starters, direct current, bulletin Nos. 2165, 2235.

Starting and regulating type, direct current, bulletin Nos. 2250, 2255.

Approved June 9, 1914.

ROSETTES, Link Fuse.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

"H. T. P. Co." 2 amperes, 125 volts.

Cleat, catalog No. 886.

Concealed, catalog No. 885.

Approved June 9, 1914.

SIGN MACHINES.—Kelley & Kelley, 105 Liberty Street, Brooklyn, N. Y.

"Thermo-Blink" flashers. These devices are thermal flashers in which the circuit is broken between two platinum contact points by the expansion and contraction of a metal strip on which is wound a heating coil.

Single circuit.

Catalog No. 1, 160 watts; catalog No. 2, 300 watts; catalog No. 4, 440 watts; catalog No. 12, 200 watts; "Midget," 60 watts; "Socket," 60 watts. For use in standard sockets and receptacles not exposed to hard usage: "Plug" 60 watts.

Two circuit.

Catalog No. 551, 60 watts each side; catalog No. 552, 220 watts each side.

Standard only when enclosed in approved cabinet, or if on or within the sign structure, when in a separate, completely enclosed accessible and weatherproof compartment.

Approved May 29, 1914.

SOCKETS, Candelabra and Miniature.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant," 75 watts, 125 volts.

Miniature, key, brass shell, catalog No. 433.

Candelabra, key, brass shell, catalog No. 434.

Approved May 8, 1914.

SWITCHES, Knife.—United Electric Manufacturing Company, 926 LaFayette Street, New Orleans, La.

125 volts, 30 amperes (for panelboard use only).

250 volts, direct current, 500 volts, alternating current, 30, 60 and 100 ampere, with and without extension for cartridge enclosed fuses, punched clips, type C.

Approved May 18, 1914.

THEATER APPLIANCES.—United Electric Manufacturing Company, 926 LaFayette Street, New Orleans, La.

Stage receptacles and plug, 25 amperes, 250 volts, 50 amperes, 125 volts. Base consists of a single piece of slate. Hardwood plug and stage cable. For use in suitable iron or steel box.

Approved May 18, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

HARTFORD, CONN.—The Manila Power Company, of Hartford, has been incorporated, with a capital stock of $1,000,000 by William Waldo Hyde, Alvan Waldo Hyde and others. The company will manage lines for the transmission of electricity in the Philippine Islands for light heat and power, as well as gas, water, refrigerating and bottling plants.

CAMDEN, N. J.—The Public Service Electric Company has presented a plan to the City Council for the replacement of its present overhead lines with an underground conduit system throughout the city. The work is estimated to cost about $250,000; the company will make the improvement at the rate of $25,000 per year, excepting the present year in which $40,000 will be expended. A.

JERSEY CITY, N. J.—The Public Service Electric Company is planning for the installation of an underground conduit system on upper Newark Avenue, from Palisade Avenue to the Five Corners, and in Summit Avenue. The establishment of an ornamental lighting system along the former thoroughfare is also contemplated. A.

PHILLIPSBURG, N. J.—F. O. Runyon, of Runyon & Carey, electrical engineers, Newark, has made a survey of the borough, under the direction of local citizens, to determine the possibilities of a power plant and system here. Final plans for the establishment of a local company for the project are being made. A.

SAYREVILLE, N. J.—The Jersey Central Traction Company, which operates the local lighting system, will install new street lamps in the Morgan Heights section. A.

SOUTH ATLANTIC STATES.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company has announced that it will construct an electric power plant, to cost approximately $300,000 at Hutchinson, W. Va., power to be furnished by means of gas engines, for which there is an ample supply of natural gas available. L.

WHEELING, W. VA.—Electrical equipment, including motors and transmission equipment, will be required in the plant of the Neff-Burns Electric Company, recently incorporated with a capital stock of $25,000, for the purpose of manufacturing electrical appliances. E. W. S. Neff, E. J. Neff, William J. Burns, G. P. Burns and others, all of Wheeling, are interested in the company. L.

CANTON, GA.—$5,000 will be expended to improve the electric light plant here. Address Howell Brooke, mayor.

NORTH CENTRAL STATES.

CHICAGO JUNCTION, O.—The Board of Public Affairs has been authorized to expend $1,500 on the city power plant. J.

LIMA, O.—A small electrical manufacturing business will be conducted at Lima, O., by the Falls Electric Company, recently incorporated there with a capital stock of $3,000. The incorporators are John D. Falls, Allen L. Metheany, Gustav Hirsch and C. F. Metheany.

MILLERSBURG, O.—The Citizens' Light & Power Company will build an electric plant for the generation of power for industrial and domestic purposes in this town. The company was recently incorporated with a capital stock of $35,000, those interested being G. H. Billman, R. E. Dreyer, W. L. Koch, F. E. Kavanaugh and C. W. Tolad. L.

SPENCERVILLE, O.—The $10,000 bond issue for repairing the old municipal lighting plant has carried. A competent engineer will be engaged to take charge and the most modern machinery will be installed. J.

UPPER SANDUSKY, O.—$25,000 in bonds have been authorized for electric-light purposes. Address the city clerk for information.

BROWNSTOWN, IND.—The new owners of the Brownstown Water & Lighting Company, E. Darrow and Robert M. Cass, who recently acquired the plant and holdings, contemplate furnishing day power service. An ice-manufacturing plant is also being taken into consideration. G.

CHICAGO, ILL.—An expenditure of over $1,000,000 for a dam and generating plant at Dresden Heights will be made by the Public Service Company of Northern Illinois in the near future. Address Samuel Insull, president of the company, for particulars.

HAVANA, ILL.—The cluster-lamp movement received a great boost when the City Council by unanimous vote went on record that if the Commercial Association would install 44 posts, the city would install an engine and generator at the water works plant to operate them. Address the city clerk for desired information.

KILBOURNE, ILL.—The village of Kilbourne is to light its streets in the near future. The Trustees of the village have appropriated a small sum to buy street lamps. Address the village clerk in regard to this improvement.

MORRIS, ILL.—As the result of the action of the United States Supreme Court in deciding against the state of Illinois in its suit to condemn the dam of the Economy Light & Power Company in the Des Plaines River, the Public Service Company of Northern Illinois, successors to the Economy Company, contemplates the expenditure of $1,000,000 on a dam and generator plant in the Des Plaines River, ten miles east of Morris. Z.

WEYAUWEGA, WIS.—The Weyauwega Milling Company and the Electric Light Company are about to begin rebuilding their plants. The capacity of the mill will be increased, and electric motors installed. A new dynamo will be placed in the electric light plant, meters will be installed and a twenty-four-hour service furnished.

ELYSIAN, MINN.—The village of Elysian, about 18 miles west of Faribault, Minn., has granted an electric franchise to the Consumers Power Company. As soon as the water-pumping and city-lighting contracts have been secured, the company will begin construction on the distribution lines within the village.

GLENWOOD, IOWA.—An election will be held on July 14 to decide whether the City Council will be empowered to grant to the Red Oak Electric Company a 25-year franchise for the purpose of wiring the town for electric light and other purposes.

DREXEL, MO.—A. J. Steele, of Adrian, Mo., has applied for a franchise to operate in Drexel. Mr. Steele is the owner of a light and power plant at Adrian, and proposes to build transmission lines into Drexel. M.

HAMILTON, MO.—True D. Parr and C. A. Martin have secured a franchise and will erect an electric light plant at Hamilton at once. The new plant will provide street lighting for the city for ten years. M.

HOPKINS, MO.—H. A. Dalby has been granted a franchise to establish an electric light plant at this place.

MARYVILLE, MO.—At a meeting at Maryville on July 1 representatives of telephone companies decided to spend about $13,000 for extensions and new equipment. W. O. Garrett and H. W. Hull, of Maryville, and C. C. Trapp, of Graham, Mo., are among those interested. M.

MEADVILLE, MO.—A movement is on foot to establish a municipal electric light plant.

NEWBURG, MO.—The Newburg Light & Power Company has been incorporated with a capital stock of $4,000, by J. O. Harpe, W. F. Houx and others.

NEW LONDON, MO.—A certificate of public convenience has been issued by the Public Service Commision authorizing the North Missouri Light & Power Company to install a plant and service in New London.

ATCHISON, KANS.—The city contemplates the installation of an electric light plant large enough to provide light for the White Way on Commercial Street. F. B. Stanley, Frank Bracke, and W. C. Linnville are members of the Light Committee of the City Council. M.

HANOVER, KANS.—The city of Hanover has reached an agreement with Fred Meyn, of the Hanover Roller Mills, whereby the latter will provide light and

power to the city for ten years. Many street lamps will be installed. The contract is effective September 1. Mr. Meyn will take over the city's equipment. M.

HORTON, KANS.—Business men of Horton propose to install a "White Way." M.

OTTAWA, KANS.—The Bushong Electrical Company has secured a contract for the construction of a transmission line from Pawnee City, Neb., to Summerfield, Kans. The contract also provides for the wiring of Summerfield. M.

PEABODY, KANS.—A straw vote was held at Peabody, indicating that sentiment is in favor of a White Way, to cost $1,000. Mayor Robel is among those interested. M.

SOUTH CENTRAL STATES.

BURKESVILLE, KY.—George H. Greenup will establish an electric light and waterworks system here.

HAZARD, KY.—A new generator installed at the plant of the Kentucky Jewel Coal Company has enabled that company to resume operations after a shutdown of six weeks due to lack of power. It is announced that the Hazard Dean Coal Company will immediately install an electric plant for its power.

MUNFORDVILLE, KY.—The New Munfordville Electric Light & Power Company has been incorporated with a capital stock of $2,800 by F. W. Wheeler, J. W. Payton and others.

SPRINGFIELD, TENN.—$10,000 will be expended in enlarging and improving the electric light system here. G. B. Sawyer is superintendent.

CHATTANOOGA, TENN.—Stewart & Johnson, architects for the new apartment being erected in Chattanoga, Tenn., for John Twinam, and contractors interested in the work, are contemplating equipping the building with electrical heating systems and electric cooking equipment. If they decide to do so the building will be the first so equipped in this part of the country. G.

HUNTSVILLE, ALA.—E. C. Lillon and associates have asked the City Commissioners for a 30-year franchise for a new gas company which will furnish this city with natural and manufactured gas and hydroelectric energy.

JACKSON, ALA.—The City Council is planning to install an electric light and water works system here, with producer gas system. Address A. E. Chunn, secretary, for further information.

LEEDS, ALA.—The Leeds Light & Power Company has been incorporated with a capital stock of $1,000. Thomas W. Martin is president.

FORT SMITH, ARK.—The City Council is planning to establish an electric light plant here. Address the mayor in regard thereto.

DEVOL, OKLA.—The City will establish an electric light plant here. Address W. T. Huff, clerk, for general information.

MANGUM, OKLAHOMA. — The Mangum City Council adopted a resolution cancelling a 25-year contract with the Mangum Electric Company for street lighting, effective in six months. It is probable that Mangum will install a combination municipal light and ice plant, such as is in operation at Weatherford. P.

CHILDRESS, TEX.—The electric light plant here, which was recently destroyed by fire, will be rebuilt at a cost of about $30,000. D.

MARBLE FALLS, TEX.—The Colorado River Power Company, which is headed by C. H. Alexander of Dallas, is preparing to construct a dam and hydroelectric plant on the San Saba River. The company is building a large dam and hydroelectric plant on the Colorado River at Marble Falls.

NAPIER, TEX.—The Northeast Electric Company of Texas has been organized here for the purpose of constructing an electric light and power plant. D.

SAN BENITO, TEX.—The City Council has granted a 50-year franchise to S. A. Robertson, trustee, to furnish the town with water, lighting and telephone service. The franchise will be transferred to a syndicate of Eastern capitalists, which will take over the plant of the San Benito Water Company. It is planned to install new machinery and make other improvements.

WESTERN STATES.

NOGALES, ARIZ.—Spiro S. Proto and Monte M. Mansfield have been granted a franchise to supply inhabitants of this town with electricity for all purposes.

SEATTLE, WASH.—The Monroe Water Company, owned and controlled by Seattle capital, recently negotiated a deal whereby the plant, franchise and good will of the Monroe Water & Light Company, of Monroe, Wash., has been taken over by the Seattle corporation. The capital stock of the new concern is $100,000. Some needed improvements and extensions will be made at once. Sidney Marshall, Monroe, is president and general manager. O.

SEATTLE, WASH.—The Stone & Webster Corporation, of Boston, Mass., owners of the Puget Sound Traction, Light & Power Company and other public utility corporations in the Northwest, recently commissioned an engineer to make investigations on the Little Susitna River, in Alaska, with a view to establishing a central power station on the line of the proposed Government railroad. The company purposes providing electric power, at all seasons of the year for the mines in that section. O.

WHEELER, ORE.—J. R. Wheeler has submitted a proposition to install a municipal electric light plant, which is being considered by the City Council.

LOS ANGELES, CAL.—A movement is on foot to extend the system of ornamental lighting on Long Beach Boulevard, the entire distance from Los Angeles to the Ocean, a distance of 20 miles. Address Victor G. Kleinberger for general information.

ORANGE, CAL.—Property owners have petitioned the City Board to place electric wires underground in the business section, and they have offered to install posts for an ornamental lighting system.

SAN FRANCISCO, CAL.—Waterpower projects which will cost $5,941,300 to construct have been sanctioned by the State Water Commission, according to a report covering the first two years of its existence. The largest of these projects is that of the Yolo Water & Power Company on Clear Lake and Cache Creek, which will cost $5,185,000, and is to develop 49,090 horsepower.

PROPOSALS.

SWITCHBOARD.—Sealed proposals will be received at the United States Engineer Depot, Washington Barracks, D. C., until July 23 for furnishing one direct-current switchboard of 16 panels. Further information may be obtained upon application to Joseph Kuhn, Lieutenant Colonel, Engineers.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 22 for furnishing the lighting fixtures for a three-story building for the post office at Medford, Ore., in accordance with drawings and specifications, copies of which may be obtained from the custodian of the site or the office of the Supervising Architect.

POWER-PLANT EQUIPMENT.—Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 25 for furnishing and installing one 40-kilowatt turbine-driven exciter in the central power plant at the navy yard, Puget Sound, Wash. Plans and specifications can be obtained on application to the Bureau or to the commandant of the navy yard named.

ELECTRICAL MACHINERY.—Bids will be received until July 14 at the office of C. C. Pashby, city clerk, Memphis, Tenn., for furnishing and erecting the following electrical machinery and auxiliaries: Four 750-horsepower wound-rotor induction motors with horizontal shaft; two 300-horsepower wound-rotor induction motors with vertical shaft; one complete switchboard for the control of the above motors with wiring connections.

TURBINE EXCITER.—Sealed proposals indorsed "Proposals for 40-Kilowatt Turbine-Driven Exciter" will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 25 for furnishing and installing one 40-kilowatt turbine-driven exciter in the central power plant at the Navy Yard, Puget Sound, Wash. Plans and specifications may be obtained upon application to the Bureau or the commandant of the navy yard.

BOILERS.—Sealed proposals indorsed "Proposals for Boilers and Accessories" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 25 for furnishing and installing four 200-horsepower water-tube boilers with accessories in the central power plant, Naval Station, Guantanamo, Cuba. Plans and specifications may be obtained upon application to the Bureau or to the Commandant of the naval station named.

ELECTRIC CABLE AND WIRE.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 21 for furnishing the following electric cable and electric wire as per the schedule number given for delivery at the Navy Yard indicated: 3,000 feet four-conductor plain interior-communication cable, 7007, Brooklyn, N. Y.; 4,200 feet twin standard Navy cable, 60,000 centimeters, 6994, Philadelphia, Pa.; 6,600 feet lead-covered paper-insulated telephone cable, 10, 30 and 60-pair, 6987, Brooklyn, N. Y.; miscellaneous telephone cable, cable terminals, clips and galvanized steel wire; 240,000 feet bell wire, 7007, 2,583 centimeters; 20,000 feet rubber-covered,

duplex, solid, two-conductor electrical wire, 6991, Washington, D. C.; 20,000 feet twisted telephone wire, for exterior use, 0.0648-inch diameter, 7005, Brooklyn, N. Y.; 103,000 feet plain twin-conductor wire, 4,000 and 30,000 centimeters, 7007, Brooklyn, N. Y.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 21 for furnishing one Roentgen-ray machine high-frequency apparatus and lead screen, as per Schedule 6992, for delivery at the Navy Yard, Philadelphia, Pa.; five switch sets, cast-steel, 70-pound, ASCE, as per Schedule 6987, for delivery at the Navy Yard, Boston, Mass.; one electric truck between 2,000 and 2,500 pounds, as per Schedule 6998, for delivery at the Navy Yard, Lake Denmark, Morris County, N. J.; one electric motor truck, for the Navy Yard, Charleston, S. C.; two electric motor trucks, for Philadelphia, Pa.; and one electric motor truck, 2,000 pounds, for Brooklyn, N. Y., all as per Shedule 6997; four portable ventilating sets, one-quarter horsepower, 123 volts, as per Schedule 6993, for delivery at the Navy Yard, Charleston, S. C.; four portable voltmeters, 0-15-150, as per Schedule 7007, for delivery at the Navy Yard, Brooklyn, N. Y., and until August 11 for furnishing four air compressors, electric-driven, vertical, inverted-type, with motors and controllers and spare parts, as per Schedule 7008, for delivery at Brooklyn, N. Y.

NEW PUBLICATIONS.

TRACTIVE CAR RESISTANCE.—The University of Illinois bulletin No. 74 is entitled "The Tractive Resistance of a 28-Ton Electric Car," by Harold H. Dunn. This records the results of tests made on straight track in still air, which are given in the form a curve between car resistance and speed. This shows that the resistance varies between 5.25 and 26.12 pounds per ton at speeds of from 5 to 45 miles per hour.

RENSSELAER PUBLICATION.—The Department of Electrical Engineering of Rensselaer Polytechnic Institute has issued Nos. 4, 5 and 6 of the Engineering and Science Series. These are "The Electrical Resistance and Temperature Coefficient of Copper-Nickel-Manganese Alloys," by George L. Gray; "The Effect of Titanium on the Magnetic Properties of Iron," by Kenneth P. Applegate; "The Effect of an Iron Core on the Secondary Circuit of a Telephone Transformer," by Eugene C. Helwig.

UNIFORM SYSTEM OF ACCOUNTS FOR ELECTRIC RAILWAYS.—The uniform system of accounts for electric railways prescribed by the Interstate Commerce Commission in accordance with Section 20 of the Act to Regulate Commerce, has been published, effective July 1, 1914. This uniform system of accounts supersedes the classification of expenditures for road and equipment, operating expenses and operating revenues which became effective January 1, 1909, and all conflicting instructions contained in Accounting Bulletin No. 7. In the preparation of the revision of the accounting rules contained i . this system of accounts the commission has had the cooperation of the Committee of Standard Classification of Accounts of the American Electric Railway Accountants' Association.

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Customhouse, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

NO. 13,300. TELEPHONE SERVICE.—An American minister reports that the contract which a foreign Government has with a telephone company has been terminated. It is thought that the proposed changes of the company will cause dissatisfaction in the country, and American telephone interests might find it to their advantage to investigate conditions with a view to investment. Copy of the complete report can be obtained from the Bureau of Foreign and Domestic Commerce.

NO. 13,314. TELEGRAPH INSTRUMENTS.—The American Consulate General at Hankow, China, has forwarded specifications and conditions of contract for telegraph instruments and material for the Hupei-Hunan section of the Canton-Hankow Railway.

NEW INCORPORATIONS.

GARY, IND.—The Horton and Williams Electric Company has been incorporated with a capital stock of $10,000 to manufacture and install electrical apparatus.

NEW YORK, N. Y.—Trenaman Electric Dental Manufacturing Company, Incorporated, has been granted articles of incorporation, capitalized at $50,000. The incorporators are John V. Trenaman, Thomas F. Diack and John J. Pagem all of New York City.

SYRACUSE, N. Y.—Miller Electric Fixture Company, Incorporated, has been granted articles of incorporation, capitalized at $2,000. The incorporators are Glen R. Herriman, Syracuse, N. Y.; Orville T. Beadle, Jamesville, N. Y.; and Irving D. Perry, Fayetteville, N. Y.

NEW YORK, N. Y.—Minwax Company, Incorporated, has been granted articles of incorporation, capitalized at $100,000, to manufacture waterproofing insulating materials, etc. The incorporators are Ridgely W. Harrison, and Arthur B. Harrison, New York City, and Lewos Compton, Perth Amboy, N. J.

BROOKLYN, N. Y.—Howard W. Bishop, Incorporated, has been granted articles of incorporation, capitalized at $5,000, for the purpose of engaging in the business of electricians and dealing in electrical appliances. The incorporators are Howard W. Bishop, Gilbert A. King, and Alvah W. Burlingame, Jr.

CHICAGO, ILL.—The Winona Electric Construction Company of Chicago has been granted a license to incorporate by the secretary of state. The capital stock is $2,500 and the firm is to do a general contracting business. The incorporators are John F. Rosen, John P. O'Shaughnessy and Joseph L. Toohey. Z.

CHICAGO, ILL.—The Chicago Electric Lamp Company of Chicago, has been licensed to incorporate by the secretary of state. The company is capitalized at $2,500 and is to manufacture and deal in lights, fixtures, novelties, electrical and otherwise. The incorporators are Samuel H. Gilbert, Oliver J. Chambers and Lewis Drucker.

FINANCIAL NOTES.

The Minnesota Light & Power Company, the newly organized subsidiary of American Public Utilities Company, has sold to Paine, Webber & Co., Boston, $1,500,000 seven-per-cent cumulative preferred stock, which will be offered at par.

Chairman Insull, of the Chicago Elevated Railways, announces that the number of passengers carried for the first five months this year was three per cent greater than last year. Early delivery of 128 new cars should result in additional yearly increase in year to July, 1915, at about nine per cent in passenger traffic.

The property and business of the Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., with a capital of $3,000,000, has been sold at public auction by the liquidating trustees for $525,000. Common stockholders who did not assent to the organization plan will receive $15 a share and preferred stockholders will receive $20 a share.

It is understood that the ten-year six-per-cent debenture notes amounting to between $6,000,000 and $7,000,000 to be issued by the Chicago Elevated Railways may be offered to the public. These were purchased by the preferred stockholders with the $6,000,000 which the Commonwealth Edison paid for the $20,000,000 common stock of the Chicago Elevated Railways.

The Electric Bond & Share Company, as fiscal agent for American Gas & Electric Company, has sold to several bankers $1,000,000 six-per-cent 100-year gold debenture bonds dated May 1, 1914, which are being offered at 97.5. Bonds are redeemable at 110 and interest on any interest date on whole or part. The $1,000,000 debentures are issued under a new open-end mortgage and additional bonds can not be issued unless the net income of the American Gas & Electric Company applicable to payment on debentures for 12 months is equal to at least three times annual interest on all outstanding debentures together with those to be issued.

A meeting of the stockholders of the Columbus, O., Railway, Power & Light Company on June 29 authorized the new financial program that had been recommended by the directors. This involves the issue of $25,000,000 first refunding six-per-cent mortgage bonds and $3,595,000 prior preference preferred stock bearing four per cent cumulative dividends. Present and future needs of the company will thus be taken care of, and outstanding bonds of underlying companies will be refunded as they mature. Outstanding and authorized, the capitalization of the company is now $36,550,000, as compared with $19,725,000 previous to the new arrangement.

President McMeen has given out the statement that between $4,000,000 and $5,000,000 of the bonds would be used for refunding and that the other requirements of financing would run from $300,000 to $500,000 a year. At present $500,000 is needed for extensions and additions. The bonds to be included under this financing plan include: $425,000 Central Market Railway first 5's; $3,000,000 Columbus Street Railway first 5's; $572,000 Crosstown Street Railway first 5's; $450,000 Columbus Electric first 6's; and $300,000 Columbus Edison Electric 5's. The prior preference preferred is to be used to retire a like amount of the Columbus Railway first consolidated 4's. Af-

ter the refunding of bonds there would be left $20,253,000 bonds authorized. The capitalization of the company would then consist of $20,000,000 bonds authorized, $3,595,000 prior preference preferred stock, $1,143,500 preferred series A, $4,066,500 preferred series B, and $6,340,000 common stock.

Dividends.

	Term	Rate	Payable
Commonwealth Ed.	Q	2%	Aug. 1
Commonw. Pr. Ry. & Lt.	Q	1%	Aug. 1
Common. Pr. Ry. & Lt. pf.	Q	1.5%	Aug. 1
Ill. No. Utilities	Q	1.5%	Aug. 1
Memphis St. Ry.	Q	0.5%	July 1
Memphis St. Ry. pf.	Q	1.25%	July 1
Met. Elev.	Q	1.25%	July 1
Northern States Pr. fd.	Q	1.75%	July 15
Pac. Tel. & Tel. pf.	Q	1.5%	July 15
Pub. Serv. Corp. of N. Ill.	Q	1.25%	Aug. 1
Pub. Serv. Corp. of N. Ill. pf.	Q	1.5%	Aug. 1
Shawinigan Water & Pr.	Q	1.5%	July 20
So. Side El.	Q	1.5%	July 1
Tampa Elec.	Q	2.5%	Aug. 15
West. States Gas & El. pf.	Q	1.75%	July 15

Reports of Earnings.

GALVESTON-HOUSTON ELECTRIC.

	1914	1913
May gross	$ 210,528	$ 202,470
Net after taxes	98,161	90,954
Surplus after charges	62,492	56,199
12 months' gross	2,442,274	2,180,999
Net after taxes	1,065,760	924,453
Surplus after charges	632,605	514,761

HUDSON & MANHATTAN.

	1914	1913
May gross	$ 473,462	$ 464,440
Net after taxes	278,700	262,599
Resources for amortization	13,490	13,490
Balance	265,210	249,108
Surplus after charges available for inc. bds.	69,730	61,715
Five months' gross	2,384,930	2,329,273
Net after taxes	1,402,320	1,326,428
Resources for amortization	67,450	53,960
Balance	1,334,870	1,272,468
Surplus after charges available for inc. bds.	362,152	.....

PACIFIC GAS & ELECTRIC.

	1914	1913
May gross	$ 1,368,892	$ 1,310,765
Net aft. tax. and mt.	646,156	551,502
Five months' gross	7,208,552	6,796,089
Net after tax. & mt.	3,543,326	2,983,509
12 months' gross	16,614,800	15,303,160
Net aft. tax. & mt.	7,430,948	6,453,892

May 31, 1914, company was serving 356,569 consumers, a gain of 30,196 over May 31, 1913. For the five months ended May 31, 1914, the company made a gain in consumers of more than 2,000 over the gain made for the corresponding five months of 1913 over the first five months of 1912.

AMERICAN GAS & ELECTRIC.

Earning for twelve months' periods ended April 30:

	1914	1913
Con. gross of subsid.	$4,006,353	$3,492,949
Bal. of sub. earnings accruing to A. G. & E.	1,031,918	952,061
Other income A. G. & E.	388,525	308,868
Gross income A. G. & E.	1,420,443	1,260,929
Exp. & Int. A. G. & E.	671,771	646,774
Net inc. A. G. & E.	748,672	614,155

Five operating subsidiaries of American Gas & Electric Company report as follows for the twelve months ended May 31, 1914:

Canton Electric Co.:

	1914	1913
Gross earnings	$ 472,239	$ 363,126
Net after taxes	227,341	180,662
Surplus after charges	164,897	128,706

Marion Light & Heating Co.:

Gross earnings	261,972	236,340
Net after taxes	114,027	96,772
Surplus after charges	77,300	61,690

Rockford Electric Co.:

Gross earnings	480,812	433,470
Net after taxes	257,790	228,723
Surplus after charges	165,418	140,319

Scranton Electric Co.:

Gross earnings	1,037,838	851,101
Net after taxes	630,691	503,259
Surplus after charges	398,826	330,179

Wheeling Electric Co.:

Gross earnings	327,706	280,983
Net after taxes	159,041	127,901
Surplus after charges	95,453	74,361

MONONGAHELA VALLEY TRACTION.

	1914	1913
May gross	$ 91,429	$ 79,473
Net	58,184	52,702
Surplus after charges	32,656	28,590
Five months' gross	403,859	363,328
Surplus after charges	124,792	118,555
Net earnings	252,203	239,088

COLUMBUS RAILWAY, POWER & LIGHT.

	May, 1914.	Five Mos.
Gross earnings	$254,559	$1,272,058
Net after taxes	87,979	465,136
Surplus after charges	40,891	232,864
Balance after preferred dividends	20,546	141,139

EAST ST. LOUIS & SUBURBAN.

	1914.	1913.
May gross	$ 227,430	$ 222,156
Net after taxes	73,719	79,818
Surplus after charges	19,033	47,767
12 months gross	2,751,609	2,553,089
Net after taxes	1,019,634	1,141,930
Surplus after charges	407,909	557,256
Balance after preferred dividends	*74,576	207,256

*Equivalent to 1.1 per cent on common stock.

AMERICAN POWER & LIGHT.

Consolidated earnings of subsidiaries:

	1914.	1913.
May gross	$ 507,290	$ 447,498
Expenses and taxes	278,088	248,341
Net earnings	229,202	199,157
12 months gross	6,189,281	5,495,386
Expenses and taxes	3,315,875	3,069,603
Net earnings	2,873,406	2,425,783

SOUTHERN CALIFORNIA EDISON.

	1914.	1913.
May gross	$ 387,515	$ 393,954
Net after taxes	209,876	211,715
Gross income	212,157	212,590
Net income	135,946	144,492
Surplus after depreciation	75,946	89,492
Five months' gross	1,910,500	1,872,864
Net after taxes	901,927	916,980
Gross income	916,333	917,042
Net income	538,894	576,093
Surplus after depreciation	378,894	306,093

CHATTANOOGA RAILWAY & LIGHT.

	1914.	1913.
May gross	$ 94,761	$ 123,316
Net after taxes	35,560	55,863
Surplus after changes	6,810	31,356
12 months gross	1,172,194	1,148,956
Net after taxes	463,035	460,280
Surplus after changes	147,229	180,236
Balance after preferred dividends	47,229	80,236

YOUNGSTOWN & OHIO RIVER RAILROAD.

	1914.	1913.
May gross	$ 21,036	$ 21,019
Net after taxes	8,172	5,052
Surplus after charges	4,006	836
11 months gross	237,945	223,897
Net after taxes	90,075	80,283
Surplus after charges	44,242	34,450

SIERRA & SAN FRANCISCO POWER.

	1914.	1913.
May gross	$ 96,652	$ 89,181
Operating expenses and taxes	38,513	44,617
Net earnings	58,139	44,564
12 months' gross	1,127,419	996,384
Operating expenses and taxes	497,206	441,039
Net earnings	630,213	553,345

LEHIGH VALLEY TRANSIT.

	1914.	1913.
May gross	$ 170,750	$ 147,652
Net earnings	95,154	74,060
Surplus after charges and taxes	36,379	28,171
Twelve months gross	1,813,194	1,643,722
Net earnings	918,437	827,130
Surplus after charges and taxes	272,908	296,849

LONDON UNDERGROUND.

London Electric Railway:

	1914.	1913.	Inc.
Week end. June 6	£14,220	£13,420	£800

London Electric Railway:

Week end. June 13	13,725	13,405	342
Jan. 1-June 13	342,840	340,150	2,690

London General Bus:

Week end. June 6	£77,299	£71,898	£5,401
Week end. June 13	68,677	67,716	961
Jan. 1-June 13	1,459,556	1,428,785	30,771

Metropolitan District:

Week end. June 6	£13,638	£13,306	£332
Week end. June 13	13,112	13,169	.....
Jan. 1-June 13	315,916	314,730	1,186

REPUBLIC RAILWAY & LIGHT.

Consolidated Reports of Subsidiaries:

	1914.	1913.
May gross	$ 257,019	$ 245,342
Net after taxes	106,987	93,608
Surplus after charges	62,541	47,904
Twelve months gross	3,078,558	2,808,242
Net after taxes	1,229,466	1,107,081
Surplus after charges	699,711	570,181

SOUTHWESTERN POWER & LIGHT.

Combined reports of subsidiaries:

	1914.	1913.
May gross	$ 216,013	$ 165,762
Expenses and tax	123,953	87,666
Net earnings	92,060	78,096
Twelve months gross	2,494,784	2,062,387
Expenses and taxes	1,365,162	1,157,000
Net earnings	1,129,622	905,387

TEXAS POWER & LIGHT.

	1914.	1913.
May gross	$ 125,418	$ 83,737
Net after taxes	87,653	53,620
Surplus after charges	28,525	13,773
12 months gross	1,372,674	1,068,974
Net after taxes	482,680	415,692
Surplus after charges	230,021	268,141
Balance after preferred dividends	98,333	168,653

CHICAGO ELEVATED.

The consolidated income account of the Metropolitan, South Side, and Northwestern elevated companies, for the last two calendar years compares as follows:

	1913.	1912.
Gross	$8,069,329	$8,014,956
Net after taxes	3,552,813	3,407,968
Total income	3,882,308	3,551,969
Surplus after charges	1,830,490	1,557,897
Total surplus available for interest on second notes	1,849,396	1,674,758
Interest on notes	700,000	700,000
Balance	1,149,396	974,758

PORTLAND RAILWAY, LIGHT & POWER.

	1914.	1913.
May gross	$ 538,473	$ 549,852
Net after taxes	251,185	280,143
Surplus after charges	67,542	117,969
12 months gross	6,739,799	6,697,304
Net after taxes	3,386,535	3,401,166
Surplus after charges	*1,282,782	1,571,879

*Equivalent to 5.2 per cent on capital stock.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 6	June 29
American Tel. & Tel. (New York)	120⅝	122¼
Commonwealth Edison (Chicago)	136	135
Edison Electric Illuminating (Boston)	249½	249
Electric Storage Battery common (Philadelphia)	51	51
Electric Storage Battery preferred (Philadelphia)	51	51
General Electric (New York)	148	146½
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	10⅝	11
Massachusetts Electric preferred (Boston)	58	59
National Carbon common (Chicago)	116½	117
National Carbon preferred (Chicago)	121	120
New England Telephone (Boston)	130	129½
Philadelphia Electric (Philadelphia)	25⅛	25
Postal Telegraph and Cables common (New York)	79½	79
Postal Telegraph and Cables preferred (New York)	69	66
Western Union (New York)	58¾	57
Westinghouse common (New York)	75¾	74½
Westinghouse preferred (New York)	122	123

PERSONAL MENTION.

MR. B. W. LYNCH has been appointed assistant to general auditor of H. M. Byllesby & Company. Mr. Lynch has been general auditor of the Consumers Power Company of Minneapolis.

MR. L. H. SHOEMAKER has been appointed division engineer of the Pittsburgh division of the American Bridge Company to succeed MR. RICHARD KHUEN, JR., transferred to the erecting department.

MR. PHILIP D. LAIRD has resigned as chairman of the Maryland Public Service Commission, to take effect August 1. Mr. Laird will not sit on any cases before the Commission after July 15.

MRS. OLIVE HUPPERT, formerly demonstrator for the Utah Light & Railway Company, at Salt Lake City, has resigned to accept a position with the Elko-Lamoille Power Company, of Elko, Nev., as demonstrator in that company's new electric shop.

MR. P. P. CRAFT, who has been vice-president and general manager of the Iowa & Illinois Railway, a subsidiary of the United Light & Railway Company, has resigned to become manager of the Mobile Light & Railway Company, of Mobile, Ala.

MR. W. A. ZIMMERMAN, formerly secretary and general manager of the Mercury Manufacturing Company, has been appointed director of sales and publicity for the Buffalo Electric Vehicle Company, Buffalo, N. Y. MR. F. C. BROWN, formerly district manager for the Chase Motor Truck Company, has been made sales manager of the truck department of the Buffalo Electric Vehicle Company.

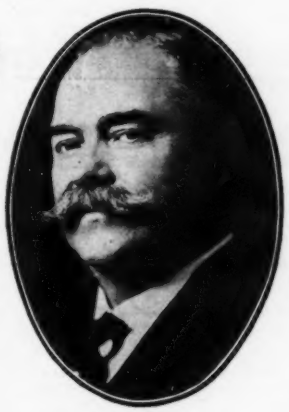
MR. ARTHUR B. WILSON, for the past five years assistant sales manager of the Tungstolier Works, has become identified with the jobbing division of the Holophane Works of General Electric Company, at Cleveland, O. Mr. Wilson's connection with the electrical trade dates from 1891, five years of this service being spent in the jobbing business as assistant sales manager of the Commercial Electrical Supply Company, of St. Louis.

MR. FRANK B. MERRILL, who has worked for the Tokepa (Kans.) branch of the Western Union Telegraph Company for 45 years, has been retired on a pension. He is the first Kansas employee to reap the benefit of the company's pension system, recently put into effect. Mr. Merrill started with the company in 1869 and has been with it continuously since that time. He will receive $40 a month for life.

MR. DUDLY A. JOHNSON has been appointed Chicago branch manager of the Joseph Dixon Crucible Company, succeeding the late SAM MAYER. Mr. Johnson was for a number of years assistant to Mr. Mayer in Chicago, and is well equipped by experience and many years' acquaintance with the Dixon line to serve the company and its customers efficiently. He went with the Dixon Company in 1898, having had considerable experience in the lead pencil and stationery business with P. F. Pettibone & Company and the Holyoke Envelope Company.

MR. H. T. WILLETT, secretary of the Springfield (Ill.) Gas & Electric Company, and of the Springfield Consolidated Railway Company, has resigned his position on the advice of his physician, and has been succeeded temporarily in office by MR. CHARLES WELSH, who has been assistant to the chief auditor of the Hodenpyl-Hardy syndicate at New York for some time. Mr. Willett has been with the company for the last seven years and resolutions expressing regret of the directorate were passed at a recent meeting. Willett has gone to Scituate, Mass., where he will remain for some time.

MR. THOMAS E. MURRAY, vice-president of the New York Edison Company, has been elected a member of the board of trustees of the Emigrant Industrial Savings Bank of New York. Mr. Murray is one of the foremost men in the electrical industry today. In addition to his association with the Edison Company he is president of the Metropolitan Engineering Company, the Yonkers Electric Light & Power Company, vice-president of the Consolidated Telegraph and Electrical Subway Company, and the United Electric Light & Power Company. He is a director of the Electrical Testing Laboratories, the Edison Electric Illuminating Company of Brooklyn, the Manhattan Refrigerating Company, the Peoples Trust Company and many other organizations. Mr. Murray's most noteworthy engineering achievements include the planning of the Waterside stations of the New York Edison Company, the new station of the United Electric Light & Power Company, the plants of the Brooklyn Edison Company, and recently the hydroelectric plant of the Chattanooga & Tennessee River Power Company. In 1910 the Franklin Institute awarded him the Edward Longstreth medal for his system of safety devices and protective appliances for interior electric wiring. These devices afford protection from the service to the point of consumption and are adaptable to the smallest as well as the largest installations. They are covered by some 50 patents.



Thomas E. Murray.

MR. W. H. ACKER, for some time electrical engineer with the M. & S. Railway & Light Company, of Youngstown, O., recently resigned to become transmission engineer of the West Penn Traction Company with headquarters at Pittsburgh. Mr. Acker was the guest of a number of his friends, including his associates in the company, at an affair given on the eve of his departure to take up his new duties. He was presented with a leather rocking chair by a number of the employees of the company, and was the subject of highly eulogistic remarks on the occasion of the presentation.

DR. HENRY S. PRITCHETT has been elected by the directors of the Atchison, Topeka & Santa Fe Railroad Company to fill the vacancy on the Board caused by the recent death of MR. BYRON L. SMITH, of Chicago. Mr. Pritchett is president of the Carnegie foundation, and formerly was president of the Massachusetts Institute of Technology. Especial interest centers in his addition to the directorate of the Santa Fe, for this constitutes still another application of a growing custom among the larger corporations of choosing educators and philanthropists to hold directors' appointments.

MISS HELEN L. BARTLETT, formerly teacher of cooking in the Salt Lake High School, has accepted a position as demonstrator in the Electric Shop with the Utah Light & Railway Company at Salt Lake City, Utah. Miss Bartlett has made a careful study of the application of electricity to cooking purposes and has written several articles on the subject. It was largely through her recommendation that the Board of Education of Salt Lake City decided to install electric ranges and cooking appliances in the cafeteria of the new $100,000 East Side High School recently completed, and also to install electric cooking equipment in the demonstration department of the high school.

MR. TRACY ROGERS, president of the Binghampton Railway Company; MR. T. J. FOSTER, president of the Scranton & Binghampton Railway, and other officials of both roads, have completed a trip of inspection of the properties. It is announced that every effort will be exerted to complete a line to Binghampton by 1915.

MR. J. F. C. SNELL, president-elect of the Institution of Electrical Engineers of Great Britain, has been knighted by King George in recognition of services rendered in connection with the government purchase of the properties of the National Telephone System. MR. ALBERT H. STANLEY, managing director of the London underground tubes and buses, who went to London several years ago from America, has been given a like distinction.

OBITUARY.

MRS. MARGARET BUSHONG, wife of Ivan Bushong, of the Bushong Electrical Company, of Ottawa, Kans., died in Kansas City, Mo., on July 5, after an illness of a year. Mrs. Bushong was 34 years of age. Interment was at Ottawa.

MR. HERMAN PORTER KIMBALL, who for nearly 12 years past has been associated with the New York office of the Standard Underground Cable Company, of Pittsburgh, Pa., died Wednesday, June 24, at his home, in New Rochelle, N. Y. He was born in Fitchburg, Mass., 48 years ago, and was the son of the late Altheus Porter Kimball. He was educated in the schools of Fitchburg, and for six years prior to his connection with the Standard Underground Cable Company, was engaged in electrical engineering and manufacturing. He was a member of the Wykagyl Country Club and the Republican Club. He is survived by his mother, his widow and a daughter. Mr. Kimball was most highly esteemed by his associates and held in the highest regard by everyone with whom he came in contact.

DATES AHEAD.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery Place, New York, N. Y.

New England Section, National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 8-11. Secretary, S. E. Pohe, Bloomsburg, Pa.

American Institute of Electrical Engineers. Pacific Coast convention, Spokane, Wash., September 9-11. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Association of Edison Illuminating Companies. Annual convention, White Sulphur Springs, W. Va., September 14-17. Secretary, George C. Holberton, San Francisco, Cal.

Association of Iron and Steel Electrical Engineers. Annual convention, Cleveland, O., September 14-19. Secretary, W. T. Snyder, McKeesport, Pa.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 15-18. Secretary, C. R. George, Houston, Tex.

Illuminating Engineering Society. Annual convention, Cleveland, O., September 21-25. Secretary, Joseph D. Israel, 1000 Chestnut Street, Philadelphia, Pa.

American Electrochemical Society. Twenty-sixth general meeting, Niagara Falls, N. Y., October 1-3. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual reunion, Richmond, Va., October 29-30. Secretary, Henry W. Pope, New York City.

With the Electrical Manufacturers

Driver-Harris Wire Company, Harrison, N. J., manufacturer of electric wire, will build a large addition to its plant, to cost about $13,000.

General Electric Company will build a three-story addition to its plant at Harrison, N. J. The general contract for erection has been awarded to Salmond Brothers Company.

Hart & Hegeman Manufacturing Company, Hartford, Conn., announces that it has become exclusive agent for the H. T. Paiste Company, Philadelphia, Pa.

W. S. Edwards Manufacturing Company, Chicago, Ill., has issued a loose-leaf catalog of lighting fixtures indicating the material which is available for immediate shipment. This is put in such shape that easy reference is facilitated.

The Pittsburgh Transformer Company, Pittsburgh, Pa., held its first annual picnic at Brookers Grove, on Friday, July 3. Refreshments, dancing and sports made the affair a very enjoyable recreation. Prizes were awarded for the successful ones in the various contests. All expenses were borne by the company, and everybody had a good time.

The Lektric Sales Company, Louisville, Ky., is the name of a new organization, which will manufacture and sell electrical supplies. Organization of the company has not been effected as yet nor officers elected. Archibald E. DeBow, with the Mengel Box Company, Louisville, is one of the incorporators. Others are Charles L. Stephens, Thomas J. Comer, Frederick O. Bullis and Frank G. Clark. The company is capitalized at $175,000.

James Clark, Jr., Electric Company, Louisville, Ky., has received a contract from the Federal Chemical Company for motors aggregating 118 horsepower to be used in the new fertilizer factory which is being built in Louisville to replace the old one recently destroyed by fire. The motors will be used in part to operate the sacking and packing machinery, similar power being employed at the Nashville factory of the company.

Allen-Bradley Company, 495 Clinton Street, Milwaukee, Wis., has issued its Bulletin B-571, which describes the Allen-Bradley speed regulators for two phase or three-phase slip-ring induction motors. These contain carbon compression resistance units, the adjustment of which is obtained by a handwheel, thus giving an almost infinite adjustment between minimum and full speed.

A. D. Granger Company, 90 West Street, New York, N. Y., has issued bulletin No. 2 describing the Oswego internally fired water-tube boilers. The general construction and the advantages of this type of boiler are described. These boilers are made in a large variety of sizes and for various pressures. The bulletin is well illustrated with perspective and sectional views of the boilers and with views of many buildings in which they have been installed.

The Robbins & Myers Company, Springfield, O., has issued bulletin No. 119, which deals with direct-current motors of the types R and IL, which are particularly suitable for driving printing presses and linotype machines. This bulletin describes these motors in considerable detail with the aid of numerous illustrations of the machines themselves and of printing and linecasting machines with which they are used. Full data are given on the respective sizes of these motors, together with dimension diagrams.

Henderson-Lee Company, 11 to 17 South Desplaines Street, Chicago, Ill., has been organized to carry on a sales agency business, and is representing at the present time the National Enameling & Manufacturing Company, Youngstown, O.; Penn Yan Cable Company, Penn Yan, N. Y.; Republic Mica Company, New York City; Star Engineering Company, Cleveland, O.; Barnes-Lindsley Company, Spokane, Wash. The officers are: Ray P. Lee, president and treasurer; A. F. Henderson, secretary.

Pawling & Harnischfeger Company, Milwaukee, Wis., has issued bulletin No. 301 A, which is entitled "The Application of the Electric Hoist." It describes several forms of overhead monorail hoist, traveling on the lower edges of an I-beam suspended on the ceiling or roof of a building or on A-frames in the yard. All these hoists have motors for hoisting; some have lifting magnets for picking up iron loads. The hoists are propelled either by hand or motor power. The advantages of this type of hoist are clearly set forth in the bulletin.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has secured the contract from the American Oak Leather Company for equipment it will use in electrifying its Louisville, Ky., tannery. This is one of the largest installations in the Louisville field and will represent an outlay of about $20,000. Two 250-kilowatt generators, one 100-kilowatt generator and 500 horsepower of motors will be installed, all of the alternating-current type. The company had intended to purchase used machinery for the Louisville plant but on further consideration decided that new machinery throughout would answer the purpose better.

The Esterline Company, Indianapolis, Ind., has issued catalog No. 321. This deals with the Esterline graphic efficiency instruments. These recording meters are made for a variety of purposes, chiefly electrical; they are used for forming a continuous record of volts, amperes, kilowatts or horsepower, speed, temperature, pressure, etc. The catalog gives a general description of the entire line of instru-

ments and of features in common with the various types. Construction details, particularly of the electrical instruments are given. Accessories and auxiliary apparatus are also described. A number of typical charts showing the kind of record produced and dimension diagrams are also included. Throughout the catalog, which consists of 40 pages, there is a very large number of fine half-tone illustrations showing these meters and various parts thereof. The catalog is exceptionally well written, so that the operation and construction of these instruments can be clearly understood.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., reports the receipt of the following orders: Charleston & Interurban Railway Company, Charleston, W. Va., one 300-kilowatt three-phase rotary converter; three 110-kilowatt transformers and one switchboard to control same. Atlantic Shore Railway Company, Kennebunk, Me., one 300-kilowatt three-phase rotary converter. Benton Harbor & St. Joe Railway & Light Company, Benton Harbor, Mich., one 300-kilowatt three-phase rotary converter. United Gas & Electric Engineering Corporation, Baltimore, Md., three 1,000-kilowatt rotary converters. Hershey Traction Company, Pa., one 300-kilowatt three-phase rotary converter. Centerville Light & Traction Company one 300-kilowatt three-phase rotary converter; one 200-kilowatt three-phase rotary converter. Pacific Gas & Electric Company, San Francisco, Cal., one 1,000-kilowatt six-phase rotary converter. Jamestown, Westfield & Northwestern Railway Company, Jamestown, N. Y., one complete, portable substation consisting of one 500-kilowatt, six-phase rotary converter; one 550-kilowatt three-phase outdoor-type transformer; one two-panel switchboard to control the above, and one substation car complete. Pacific Gas & Electric Company, San Francisco, Cal., five 1,000-horsepower generator on common base and shaft with five 1,440-horsepower three-phase synchronous motor.

Record of Electrical Patents.

Issued by the United States Patent Office, June 30, 1914.

1,101,523. Vapor Electric Device. F. Conard, assignor to Westinghouse Electric & Mfg. Co., Swissvale, Pa. Comprises a metal casing and an insulating cup containing the vaporizable electrode.

1,101,527. Electric Heating Device. H. W. Denard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. A heating cylinder, movement of the door of which actuates a snap switch.

1,101,533. Wireless Telegraphy. L. de Forest, assignor to De Forest Radio Telephone Co., New York, N. Y. The transmitting and receiving antennas are both horizontal and in the same vertical plane.

1,101,539. Power-Transmission Mechanism. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. For an electric starter.

1,101,540. Contract-Making Mechanism. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. For a maximum-demand meter.

1,101,550. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Electric oven with heat-storage walls.

1,101,551. Melting Ferromanagnese. E. Humbert, Chicago, Ill. Electric furnace process.

1,101,554. Electric Railway-Switch. D. W. Johnson, Saginaw West Side, Mich. Motor-operated track switch.

1,101,575. Automatic Current Cutoff for Electric Appliances. U. S. Smith, Sacramento, Cal., assignor of one-half to A. C. Kaufman. Thermostatic plug ejector for flatiron.

1,101,579. Flexible Electric Conductor. L. Steinberger, New York, N. Y. The body is of figure-8 section with a conducting sheath around the lower portion.

1,101,617. Regulating Valve. G. W. Collin, assignor to Collin Valve Co., Bridgeport, Conn. Includes an electromagnetically actuated pilot valve.

1,101,618. Motor-Generator. C. W. Dake, assignor to Pyle National Electric Headlight Co., Chicago, Ill. Has a special connecting sleeve between the motor and generator housings.

1,101,620. Extraction of a Metal by Electrolytic Exhaustion of a Solution of a Salt of This Metal. N. H. M. Dekker, Paris France. A porous wall divides the cell into anode and cathode chambers.

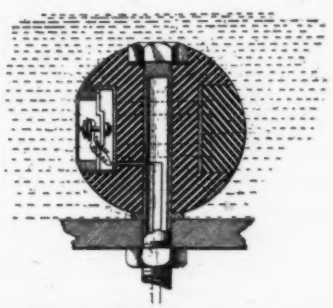
1,101,629. Arc-Control Mechanism for Projectors. J. L. Hall, assignor to General Electric Co. Has an electromagnet with two armatures, one acting to increase and the other to decrease the arc length.

1,101,663. Block System for Railroads. W. L. Rummel, McLean, Neb. Includes a motor-driven rail depressor.

1,101,665. Vapor Electric Device. Y. Saki assignor to Westinghouse Electric & Mfg. Co. A modification of No. 1,101,523.

1,101,666. Trolley Pole and Trolley Guard. T. Santore, Mount Braddock, Pa., assignor of one-sixth to D. Jenaway. For a mine locomotive.

1,101,669. Controller. L. L. Tatum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. The controller handle must be held until the motor attains a certain speed.



1,101,830.—Submarine Microphone Signal-Receiver.

1,101,670. Relay. A. T. Tirrill, assignor to General Electric Co. Has an E-shaped core with two coils oppositely wound.

1,101,672. Induction-Motor Winding. J. E. Webster, assignor to Westinghouse Electric & Mfg. Co. A squirrel-cage winding with laminated end rings.

1,101,679. Selective Signaling Device. J. P. C. Boswau, assignor to Western Electric Co. Selector for telephone train dispatching.

1,101,684. Automatic Telephone-Exchange Selector. E. B. Craft, assignor to Western Electric Co. Automatic telephone switch.

1,101,686. Incandescent Electric Headlight. C. W. Dake, assignor to Pyle-National Electric Headlight Co., Chicago, Ill. Has a cluster of lamps with their tips turned toward the center of the headlight.

1,101,715. Electric Gate-Operating Means for Railroads. E. Salisbury, Aspen, Colo., assignor of one-half to G. Runtz. Motor-operated crossing gate.

1,101,728. Lightning Arrester. E. B. Craft, assignor to Western Electric Co. Includes an evacuated gas bulb.

1,101,731. Switchboard Plug. R. M. De Vignier, assignor to Western Electric Co. A twin telephone plug.

1,101,742. Incubator. E. C. Hays, Waco, Texas. Has a number of electric heaters and a thermostatic controller therefor.

1,101,752. Lightning Arrester. D. T. May, assignor to Western Electric Co. A modification of No. 1,101,728.

1,101,798. Contact-Making Voltmeter. C. J. Hejda, assignor to Associated Engineers Co., Chicago, Ill. Includes a floating contact.

1,101,802. Conductor-Clamp. M. G. Kennedy, assignor to States Co., Syracuse, N. Y. For holding a wire to an insulator.

1,101,814. Brush-Holder for Dynamo-Electric Machines. A. N. Sammarone, Akron, O. Covers details of construction.

1,101,821. Electric Heating Device. T. VanAller, assignor to General Electric Co. Electromagnetic thermostatic regulator for flatiron.

1,101,830. Submarine Signal-Receiving Apparatus. C. Berger, assignor to Submarine Wireless Co., New York, N. Y. A microphone mounted in a cell secured to hull of ship. (See cut.)

1,101,834. Spark Plug. P. T. Campbell, Bridgeport, Conn. Has a hollow gas chamber at its lower end.

1,101,838. Sleet-Cutter for Overhead Trolleys. J. E. Dozier, Lynn, Mass., assignor of one-half to D. Stimson, Newton, Mass. The cutter is mounted between the ends of spring arms.

1,101,853. Automatic Telephone System. A. E. Keith, J. Erickson and C. J. Erickson, assignor to First Trust & Savings Bank, Chicago, Ill. Covers a combined hook-switch and calling mechanism.

1,101,854. Automatic Trunking System. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. Automatic trunk-selecting switches for telephone system.

1,101,858. Process of Joining Metal. L. S. Lachman, assignor to Universal Electric Welding Co., Long Island City, N. Y. Electric spot-welding process.

1,101,866. Circuit-Closer. D. A. McConnell, assignor to Lovell-McConnell Mfg., Newark, N. J. Push-button.

1,101,870. Lock Switch. E. R. McKinzie, Memphis, Tenn. Curved spring contact plates bear against the open head of the key post.

1,101,892. Pipe-Conduit Fitting for Electric Installation. W. H. Vibber, New London, Conn., assignor of one-half to Gillette-Vibber Co. A sectional box secured by a nut internally threaded for the end of the conduit and formed with a segment adapted to be cut away for lateral application to wires already run in. (See cut.)

1,101,897. Refillable Cartridge-Fuse. E. Alexander, Burlingame, Cal. Relates to the end construction of the ferrules. (See cut.)

1,101,906. Method of Recording and Reproducing Sound. F. W. H. Clay, Pittsburgh, Pa. In addition to the undulations of the recorded sounds there is produced electrically a series of undulations of higher frequency.

1,101,914. Apparatus for Electric Signaling. R. A. Fessenden, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. The radiating conductor consists of several composite and cumulatively acting horizontal antennas connected in series.

1,101,915. Wireless Singnaling. R. A. Fessenden, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett. Two horizontal antennas, the one encircling the other and connected to it by an inductance, capacity or both.

1,101,917. Brush-Holder. D. B. Flower, Glenside, Pa. Includes a worm-gear spring-tension device.

1,101,938. Voltage-Regulator. W. G. Kinton, assignor to Western Electric Co. Storage batteries placed in shunt with sectionalized resistance to prevent sudden changes in voltage across resistance.

1,101,939. Wire Connector. G. C. Knauff, Chicago, Ill. A plug connector having one contact pivoted so as to adjust itself to the alinement of the other.

1,101,946. Indicating Electric Fuse plug. J. H. Miller, Bridgeport, Conn., assignor of one-half to J. L. Carpenter. A spring attached to indicating device is released upon blowing fuse.

1,101,958. Safety Circuit Controller for Traffic-Controlling Systems. W. H. Reichard, assignor to Federal Signal Co., Albany, N. Y. An automatically controlled railway switching arrangement.

1,101,963. Device for Securing Conductors to Junction-Boxes. M. C. Rosenfeld, Cleveland, O. A sleeve with securing cam-shaped nut fitting threads on sleeve.

1,101,968. Method of Making and Filling Storage-Battery Plates or Electrodes. E. W. Smith, Philadelphia, Pa. A rocker arrangement for causing rods to distribute and pack active material in tubular openings.

1,101,987. Signaling System and Apparatus. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. An electromagnetically controlled signal train with interlocking means.

1,101,994. Contrifugally Operated Switch. A. J. Brown, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Centrifugally operated shaft contacts short-circuit fixed contacts at predetermined speed.

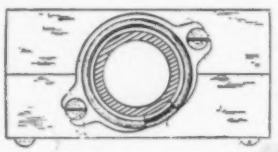
1,101,998. Automatic Time-Switch. G. R. Clark, assignor to Clark & Harvey, Dayton, O. Covers details of arrangement of switches.

1,101,999. Burglar-Alarm. W. E. Clark, Saranac Lake, N. Y. Contacts attached to floor boards and beams.

1,102,000. Vacuum-Cleaner Handle. G. Clements, Chicago, Ill. Electric switch mounted in handle.

1,102,007. Sound-Transmitter. W. H. Cotton, assignor to S. & M. Electric Co., Chicago, Ill. A cone-shaped reflecter is inserted in the mouthpiece.

1,102,009. Electric Lamp. H. Csanyi, assignor to Maxivolt Primary Battery Co., New York, N. Y. An interrupter consisting of two resilient



1,101,892—Sectional Conduit Box.

members which spring together upon the breaking of lamp bulb.

1,102,010. Primary Battery. H. Csanyi, assignor to Maxivolt Primary Battery Co. A ventilating tube for batteries.

1,102,079. Separable Fixture-Joint. A. D. Rizer, Elgin, Ill. An insulating electric fixture joint in two parts.

1,102,087. Elecric-Fan Tractor. M. P. Sarfaty, New York, N. Y. A propeller-driven vehicle.

1,102,116. Dynamo-Electric Machine. J. J. Wood, assignor to General Electric Co. Synchronous and nonsynchronous motors resiliently connected.

1,102,119. Brush-Holder for Dynamo-Electric Machinery. A. Aichele, assignor to Aktiengesellschaft Brown, Boveri & Cie., Baden, Switzerland. Brush pressure obtained by horizontal

1,101,897.—Refillable Cartridge Fuse.

flexible member pushing on vertical rod attached to brush.

1,102,126. Wire-Connector. E. C. Barnes, E. T. Hagist, and G. Neil, Philadelphia, Pa. Tongs encircle wire and are tightened by a conical nut.

1,102,132. Automatic Train-Stopping Apparatus. J. L. Boyer, Johnstown, Pa. Means for disconnecting motor from driving shaft.

1,102,160. Advertising Sign. B. S. McFarlan, Spokane, Wash. Transparent and translucent screens move across path of rays from incandescent lamp.

1,102,164. Switchboard-Cord Reel. F R. Parker, Chicago, Ill. A two-part insulated pulley carrying bare wires and taking up slack.

1,102,184. Detector for Wireless Telegraphy. C. Browne, assignor to Browne Apparatus Co., Salem, Mass. A detector composed of crystals of copper pyrites and zinkite.

1,102,185. Pneumatic-Despatch-Tube Apparatus. J. T. Cowley, assignor to Lamson Co., Newark, N. J. Includes use of valve-operated electric-motor-blower set.

1,102,209. Electrolytic Process of and Apparatus for Producing Compounds. E. A. Byrnes, Washington, D. C.; A. S. Byrnes, administratix of E. A. Byrnes, deceased. Ions of adjacent electrolytes discharge and combine on intermediate electrode.

1,102,218. Score-Board or the Like. S. Baird, assignor to Electric Score Board Co., Boston, Mass. Solenoid-controlled pawls actuate ratchet wheel containing score numbers.

Patents Expired.

The following United States electrical patents expired July 6, 1914.

585,647. Electropneumatic Circuit Closer. H. C. Batcheller, Brooklyn.

585,662. Switchboard for Central Telephone-Stations. C. E. Egan, Chicago, Ill.

585,663. Electric Attachment for Musical Instruments. W. B. Fleming, Detroit, Mich.

585,699. Reversible Primary Battery. L. W. Pullen, Camden, N. J.

585,707. Joint or Splice for Electric Wires or Cables and Method of Making Same. F. Schwedtmann, St. Louis, Mo.

585,726. Electric Arc Lamp. J. J. Walsh, Paris, Tex.

585,731. Telegraph Switch. J. S. Allen, Halsey, Nebr.

585,733. Railway Signaling System. H. Bezer, New Rochelle, N. Y.

585,746. Brush-Holder. H. Geisenhoner, Schenectady, N. Y.

585,755. Compensating Device for Engines. F. Haselwander, Frankfort-on-the-Main, Germany.

585,760. Electric Motor for Elevators. J. D. Ihlder, Yonkers, N. Y.

585,772. Electric Controller. A. F. MacDonald, Schenectady, N. Y.

585,778. Machine for Raising or Lowering Electric Lights. L. McLeod, Cannington, Canada.

585,853. Secondary Battery. I. Samuels, New York, N. Y.

585,854, and 585,855. Galvanic Battery. J. Sully, New York, N. Y.

585,863, and 585,864. Armored Electrical Conduit. E. T. Greenfield, New York, N. Y.

585,872. Brush-Holder for Dynamo-Electric Machines. R. Lundell, Brooklyn, N. Y.

585,892. Electricity Meter. A. W. Staveley, I. H. Parsons and T. J. Murday, Leicester, England.

585,896. Telephone Transmitter. E. C. Wilcox and B. L. Lawton, Meriden, Conn.

585,904. Automatic Cut Out. C. N. Black, New Haven, Conn.

585,937. Electromagnetic and Mechanical Brake. J. E. Parker, Bayonne, N. J.

586,006. Magnetic Clutch. A. De Bovet, Paris, France.

586,029. Electric Switch. F. D. Hall, Syracuse, N. Y.

586,044. Electric Storage or Secondary Battery. F. King, London, England.

586,055. Manufacture of Incandescent Lamps. J. W. T. Olan, New York, N. Y.

586,075. Electric Switch. E. Oxley, Washington, D. C.